FINAL REPORT

VINELAND CHEMICAL SUPERFUND SITE: PHASE V SEDIMENT SAMPLING VINELAND, NEW JERSEY

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LIST OF ABBREVIATIONS, ACRONYMS, AND UNITS

ADR	Automated Data Review
ASTM	American Society for Testing and Materials
°C	Degrees Celsius
COC	Chain of Custody
DESA	Division of Environmental Science and Assessment
DGPS	Differential Global Positioning System
EA	EA Engineering, Science, and Technology, Inc.
EDDs	Electronic Data Deliverables
EM	Engineer Manual
ft	Foot/Feet
HNO_3	Nitric acid
in	Inch(es)
MDL	Method Detection Limit
mg/Kg	Milligram(s) Per Kilogram (ppm)
mg/L	Milligram(s) Per Liter
mL	Milliliter(s)
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAD83	North American Datum 1983
NJ	New Jersey
ND	Non-detect
ppb	Part(s) Per Billion (µg/kg or µg/L)
ppm	Part(s) Per Million (mg/Kg or mg/L)
ppt	Part(s) Per Thousand (g/kg or g/L)
QA	Quality Assurance
QC	Quality Control
RL	Reporting Limit
ROD	Record of Decision
SOP	Standard Operating Procedure
µg/L	Microgram(s) Per Liter (ppb)
µm	Micrometer(s)

USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

1. INTRODUCTION

This December 2010 Phase V data report presents arsenic concentrations in sediment and soils from the Maurice River downstream from the Vineland Chemical Company Superfund Site in Cumberland County, New Jersey (NJ). The Phase V sediment and soil sampling was conducted at 66 locations from 12 through 14 April 2010. These data will be used to document the instream and shoreline arsenic concentrations along an 800 ft length of the Maurice River that has been impacted by previous operations of the site and upstream remediation activities. Results for soils and sediments will be compared to the Site Clean-up Level of 20 parts per million (ppm or mg/Kg).

1.1 PROJECT BACKGROUND

Previous studies have shown that the Vineland Chemical Company Superfund Site (site) has affected arsenic contamination in the soils, sediments, and ground water. The site manufactured arsenic-based herbicides from 1950 to 1994 on a 54-acre site in a residential and industrial area of the City of Vineland, NJ. The site is located adjacent and upstream from nearby waterways that include the Blackwater Branch, Maurice River, and Union Lake (Figure 1-1). The soil, sediment, and water of these waterbodies have been impacted by the operations of the site. Beginning in 1982, and in response to State actions, the Vineland Chemical Company instituted some cleanup actions and modified the production process. The site clean-up is being addressed in two stages, including immediate actions and long-term remedial phases. Four long-term, remedial phases focus on source control, migration management, and cleanup of the rivers and Union Lake sediments, which was the subject of a Record of Decision (ROD) in 1989 (USEPA 1989). The current phase of remediation at the site involves removing the contaminated soils/sediments of the Blackwater Branch and the floodplain west of Mill Road to west of the Maurice River Parkway. Future remediation efforts will focus further downstream on the Blackwater Branch and into the Maurice River below the confluence.

1.2 PROJECT LOCATION

The Vineland Chemical site is a 54-acre manufacturing facility located in Vineland, Cumberland County, NJ (Figure 1-1). The site is located in south-central NJ, approximately 40 miles from Wilmington, Delaware and approximately 35 miles from Atlantic City, NJ. The facility was involved in the production of arsenical herbicides, fungicides, and biocides since 1949. Arsenical feedstock compounds were historically stored in unprotected piles. This resulted in soil and groundwater contamination in the vicinity of the site. Runoff during storm events and the recharge of arsenic-bearing groundwater has contaminated the adjacent watershed, including nearby waterways such as Blackwater Branch, Maurice River, and Union Lake.

Phase V sediment and soil sampling was conducted at 66 locations in the Maurice River approximately 1.1 miles downstream from the Vineland Chemical site (Figure 1-2).

1.3 PROJECT PURPOSE AND OBJECTIVES

Determination of arsenic concentrations in the Phase V sediment and soil is necessary in order to provide information about environmental conditions at the site and to assist with the design of future remediation initiatives.

The sediment sampling program consisted of the following tasks:

- Sediment and soil sample collection at 66 locations (23 locations within in the Maurice River and 43 locations along the shoreline of the Maurice River);
- Analysis of arsenic in soil and sediment samples at two depth intervals (0-6 inches below sediment and soil surface and 6-12 inches below sediment and soil surface).
- Data report preparation and submittal.

1.4 EXPERIMENTAL DESIGN

The executing agency for this project is the U.S. Army Corps of Engineers (USACE), North Atlantic Division, Philadelphia District. This investigation was designed to identify, analyze, and evaluate the arsenic concentrations in sediments and soils collected at 66 locations along the Maurice River, located downstream from the site. EA Engineering, Science, and Technology, Inc. (EA) was contracted by the USACE - Philadelphia District to conduct sediment and soil sampling along a section of the Maurice River. Arsenic concentrations in each of the samples were measured by the USEPA Region II Laboratory located in Edison, NJ. The *Uniform Federal Policy/Quality Assurance Project Plan (UFP/QAPP)* (USACE 2009) described the sampling and data-gathering methods utilized for the project and followed guidance provided by the USACE Engineer Manual (EM) 200-1-3 *Requirements for Preparation of Sampling and Analysis Plans* (1994).

1.5 REPORT ORGANIZATION

This report contains a summary of field activities and the results of the sediment and soil analyses. Field sampling techniques and analytical methodologies for arsenic analyses are provided in Chapter 2 and results of the arsenic analyses are provided in Chapter 3. References cited are provided in Chapter 4. Appendix A presents the analytical results, accompanying Chain-of-Custody (COC) forms, and a copy of the field logbook. Appendix C presents the Standard Operating Procedures (SOPs) for the laboratory analysis of arsenic.

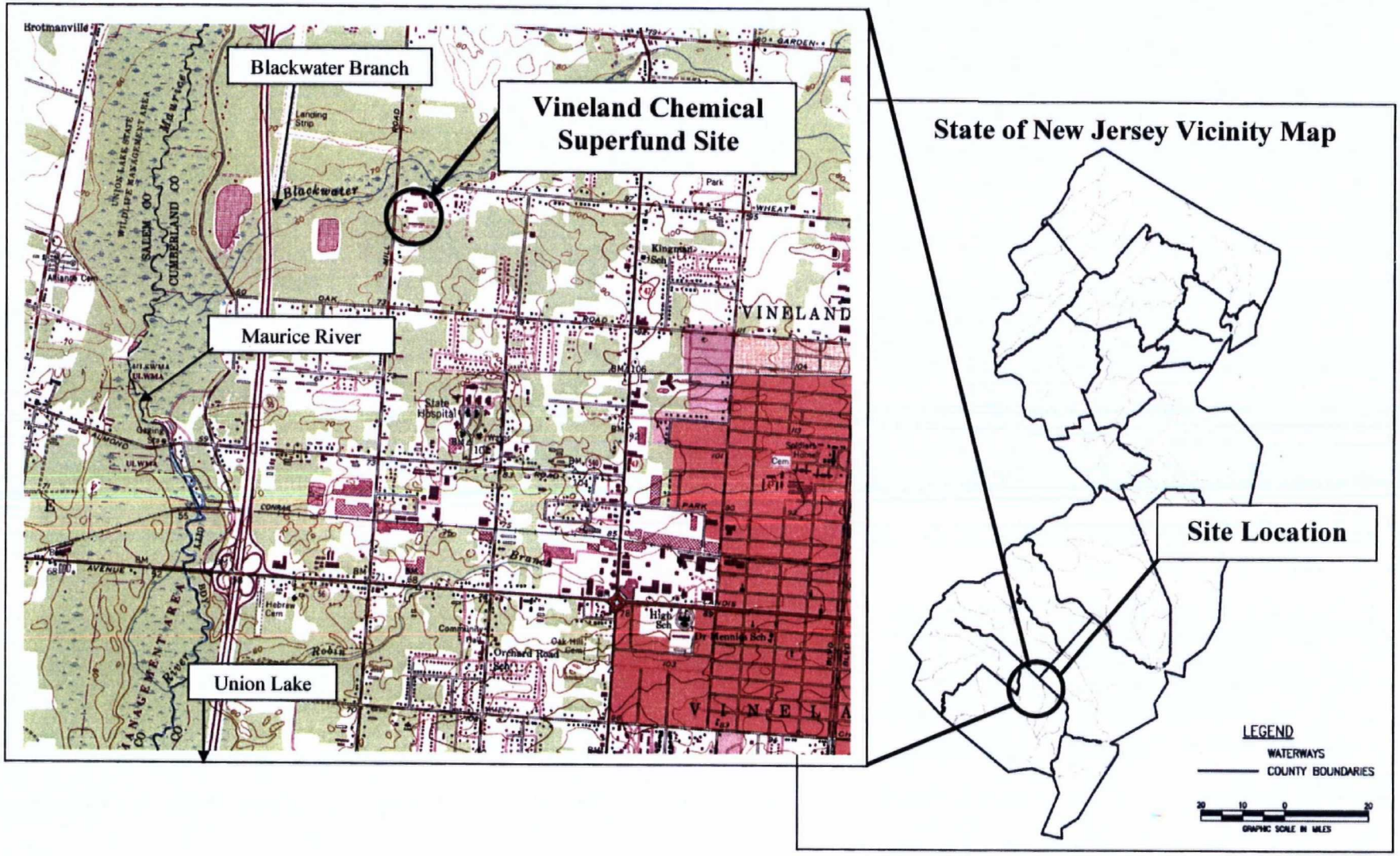

Figure 1-1. Vineland Chemical Superfund Site Location Map, Cumberland County, NJ

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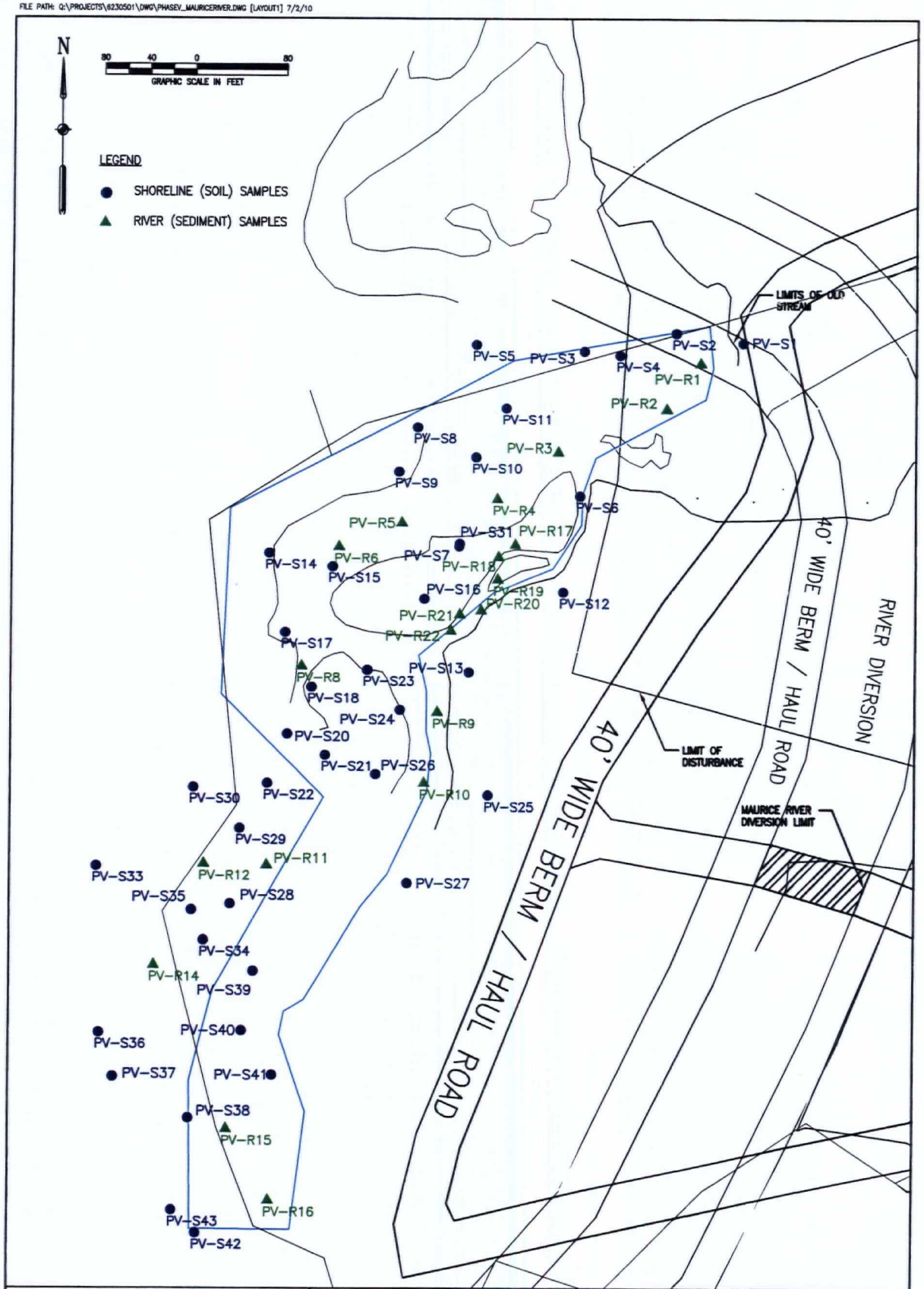

EA ENGINEERING, SCIENCE, AND TECHNOLOGY	VINELAND CHEMICAL SUPERFUND SITE VINELAND, NJ	MAURICE RIVER PHASE V SAMPLE LOCATIONS

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2. METHODOLOGY

Phase V sediment and soil sampling was conducted in accordance with the *Uniform Federal Policy/Quality Assurance Project Plan (UFP/QAPP)* (USACE 2009). Collection of the sediment and soil samples was completed on 12, 13, and 14 April 2010.

2.1 SAMPLING OBJECTIVES

Sixty-six (66) locations were sampled for sediment and soil collection. Of the 66 locations, 23 sediment samples were collected in mid-channel (instream) sections of the Maurice River. The remaining 43 soil samples were collected on the shoreline and banks of the Maurice River. The study area encompassed an approximate 800 ft length of the Maurice River downstream from the confluence with the Blackwater Branch and the Vineland Chemical site. Target sample recovery was 1 ft below sediment and soil surface; sediment and soil collected was sub-sectioned to produce two depth interval samples (0-6 inches below sediment and soil surface and 6-12 inches below sediment and soil surface).

2.2 SAMPLING LOCATION DETERMINATION

Sampling locations were provided by USACE-Philadelphia District. Figure 1-2 shows the sample locations along the Maurice River; sample location coordinates and water depths are provided in Table 2-1. Sample coordinates were recorded in the field using a Trimble GeoXT differential global positioning system (DGPS); the GeoXT uses the WAAS (Wide Area Augmentation System) to obtain accuracies of +/- 5 ft. Coordinates were recorded for each sample location in the field logbook.

2.3 SAMPLE VOLUME REQUIREMENTS

Arsenic analysis of sediments and soils required 250 grams of sediment per sample.

2.4 SAMPLE COLLECTION, STORAGE, AND TRANSPORT

Upon completion of sample collection, samples were shipped via overnight delivery to the USEPA Region II, Division of Environmental Science and Assessment (DESA) Laboratory in Edison, NJ for arsenic analyses. Samples were shipped on ice and maintained at 4^0 Celsius. Chain-of-Custody (COC) forms accompanied the samples and documented the dates and times of sample collections for arsenic analyses are included in Appendix A. Samples were received at the DESA laboratory on 17 April 2010 and were booked and logged through the Field and Analytical Services Teaming Advisory Committee (FASTAC) process.

2.4.1 Sediment and Soil Sample Collection

Sediment and soil samples were collected at 66 locations using hand-coring techniques. Sampling in the river was conducted from a jon boat; shoreline (soil) samples were taken on the edges of the river approximately 5 ft to 20 ft inland from the river bank. Samples were collected

and retained within 2 ft lengths of cellulose acetate butyrate (CAB) liner with an outer diameter of 2 inches. Sediment collected in the river was obtained using a Wildco hand-corer. For each river and instream sample, a liner was placed in the hand-corer with a core catcher placed on the end of the liner. A nose cone was fitted to the outside of the hand-corer. The sample was taken by either pushing or manually driving (with a small sledge hammer) the hand-corer into the sediment until refusal. The sampler was brought back on-board the boat and the core liner was removed, capped, and labeled.

Shoreline (soil) samples were taken by manually driving a 2 ft length of CAB liner into the soil until refusal. The liner was then removed from the soil, capped, and labeled.

2.4.2 Field Duplicates

Field duplicates are used as measures of matrix homogeneity and sampling precision. Field duplicate samples were collected simultaneously from the same sampling locations as sediment and soil samples (Table 2-2) and were collected at a rate of 10% per sample matrix. For the Phase V sampling, a total of ten duplicate samples were collected as individual co-located samples and were homogenized and analyzed separately.

2.4.3 Matrix Spike / Matrix Spike Duplicate Samples

A matrix spike (MS) is a field sample to which a known amount of analyte is added before sample preparation and analysis to evaluate the potential effects of matrix interference. Analyte concentrations in the spiked and unspiked sample are used to calculate percent recovery as a measure of matrix interference. A matrix spike duplicate (MSD) is a duplicate of the MS sample. MS/MSD samples were collected at a rate of 10% per sample matrix. Eight sets of MS/MSD for sediment and soil samples were collected for the project (Table 2-2).

2.5 EQUIPMENT DECONTAMINATION PROCEDURES

Equipment that came into direct contact with sediment and beach soil during sampling was decontaminated prior to deployment in the field to minimize cross-contamination. This included the stainless-steel Ponar, stainless steel spoons, and processing equipment (spoons, knives, bowls, extruder, etc.). While performing the decontamination procedure, phthalate-free nitrile gloves were used to prevent phthalate contamination of the sampling equipment or the samples.

The decontamination procedure is described below:

- Rinse equipment using site water
- Rinse with distilled or de-ionized water
- Rinse with 1 percent nitric acid (HNO_3)
- Rinse with distilled or de-ionized water

Waste liquids were contained during decontamination procedures and transferred to EA's facility in Sparks, Maryland, for disposal.

2.6 SAMPLE CHAIN-OF-CUSTODY AND DOCUMENTATION

2.6.1 Field Logbook

Field notes were recorded in a permanently bound, dedicated field logbook. A log of sampling activities and station locations were recorded in the log in indelible ink. Personnel names, local weather conditions, and other applicable field sampling program information were also recorded.

Sample location coordinates, approximate water depth, and weather conditions at each sampling location were recorded. Information was recorded in indelible ink. Copies of the project logbook are provided in Appendix A.

2.6.2 Sample Identification

A sample numbering system was utilized for the sediment and soil samples for Phase V sampling. The sample numbering system provided communication between the sample processing operation and the laboratory performing the desired analyses. Sediment and soil samples were identified by site name, sample type, and date of collection. The following sample identification scheme was used:

PV-R1-A or B
PV-S1-A or B

where PV indicated Phase V project, R denoted river sediment samples, S denoted shoreline (soil) samples, and the number after R or S indicated site location. The letter A was used for sample taken from the top 0 inches to 6 inches, and B for sample taken from the bottom 6 inches to 12 inches.

Field Duplicate water and sediment samples were submitted to the laboratory as blind duplicates. The site name and collection date were not designated as part of the sample identifier. Duplicate samples were designated with an identifier (i.e., PV-DUP) and number (i.e., 1, 2, 3, etc.). For example, DUP-1 was designated as the first duplicate sample collected from a random station. DUP-2 was then designated as the next (or second) duplicate sample collected from a separate random station. Locations where duplicate samples were collected and the corresponding sample ID were recorded in the field logbook for future cross-referencing with sample laboratory results. The cross-referenced sampling locations for the field duplicates are included in Table 2-2.

MS/MSD sediment, soil, and water samples were designated with identifiers added after the site name and sample type. For example, PV-R10-MS indicated a matrix spike sediment sample from sample PV-R10. The following descriptors were used for matrix spike and matrix spike duplicate samples:

- MS – matrix spike sample
- MSD – matrix spike duplicate

2.6.3 Sample Documentation

2.6.3.1 Sample Labels

Both the individual sediment cores and the processed sediment were labeled. Sample containers for the processed sediment and water samples were labeled with the following information:

- Client name
- Project number
- Sample ID
- Station location
- Date and time of collection
- Sampler's initials
- Type of analyses required

2.6.3.2 Chain-of-Custody Records

Sediment and soil samples collected in the field and at EA's processing facility were documented on a COC form. This COC accompanied the samples to the analytical laboratory. The COC indicated the date and time of sample collection and was signed by appropriate personnel. Copies of the COCs that accompanied the analytical testing for arsenic are provided in Appendix A.

2.6.4 Documentation Procedures

Documentation was initialed by the author and dated. Corrections to documentation were made with a single line through the error with the author's initials and date.

2.7 ANALYTICAL METHODS

Analytical testing for arsenic was conducted by the USEPA Region II DESA Laboratory Branch located in Edison, NJ.

2.7.1 Analytical Methods, Laboratory Quality Control, and Detection Limits

Samples obtained during the Phase V sampling were analyzed for total arsenic using extraction procedure DESA SOP C-116 and analysis procedure DESA SOP C-109. The target detection limits (TDL)/screening values and laboratory reporting limits (RL) for arsenic in the sediment and soil were as follows:

Matrix	Target Detection Limit (TDL) / Screening Value for Arsenic	Laboratory Reporting Limit (RL) for Arsenic	Extraction/Analysis Procedure
Solid	20 ppm (Site Clean-up Level)*	0.73 to 0.8 mg/Kg (ppm)	DESA SOP C-116 and SOP C-109

**The Site Clean-up Level of 20 ppm is based upon the New Jersey Residential Clean-up Standard for Arsenic.*

Copies of the USEPA Region II DESA Laboratory Branch SOPs for sample digestion and for analysis of metals are provided in Appendix C, as well as laboratory Quality Control (QC) and Quality Assurance (QA) procedures.

2.7.2 Data Validation and Electronic Data Deliverables

Data validation was conducted by the USEPA Region II DESA laboratory for the arsenic analyses. A data quality and usability statement was not provided by DESA for the analytical results. Data are usable for the intended purpose except where noted by the USEPA data validation qualifiers.

TABLE 2-1. SEDIMENT AND SOIL LOCATION INFORMATION

Phase V Sediment Sampling, Vineland, New Jersey (April 2010)

Location ID	Date	Time	Northing (ft)	Easting (ft)	Water Depth (ft)	Sediment and Soil Recovery Depth (in)
			New Jersey, NAD 83			
River Locations						
PV-R1	4/12/2010	1145	245112	329354	4.0	8.0
PV-R2	4/12/2010	1255	245071	329325	5.6	3.0
PV-R3	4/12/2010	1309	245033	329230	2.9	8.0
PV-R4	4/12/2010	1324	244992	329176	5.0	2.0
PV-R5	4/12/2010	1344	244971	329092	4.8	8.0
PV-R6	4/12/2010	1419	244950	329038	5.2	7.8
PV-R7	4/12/2010	1431	244896	329023	4.8	2.5
PV-R8	4/12/2010	1452	244845	329006	4.8	3.0
PV-R9	4/12/2010	1505	244804	329124	5.0	4.0
PV-R10	4/12/2010	1603	244742	329113	4.7	17.0
PV-R11	4/12/2010	1625	244670	328977	4.8	17.0
PV-R12	4/12/2010	1641	244671	328922	5.7	3.0
PV-R13	4/12/2010	1653	244665	328883	5.3	5.0
PV-R14	4/12/2010	1708	244584	328878	3.2	7.5
PV-R15	4/12/2010	1724	244442	328943	4.2	8.6
PV-R16	4/12/2010	1738	244380	328980	6.3	12.0
PV-R17	4/13/2010	1109	244952	329193	4.4	5.5
PV-R18	4/13/2010	1119	244941	329178	3.4	9.5
PV-R19	4/13/2010	1130	244921	329177	2.0	12.5
PV-R20	4/13/2010	1145	244894	329162	1.7	4.0
PV-R21	4/13/2010	1157	244890	329144	3.6	6.0
PV-R22	4/13/2010	1216	244876	329136	5.0	15.0
Shoreline Locations						
PV-S1	4/13/2010	0745	245130	329391	1.3	7.0
PV-S2	4/13/2010	0757	245139	329333	1.7	8.0
PV-S3	4/13/2010	0813	245123	329253	1.6	6.0
PV-S4	4/13/2010	0825	245119	329284	1.3	10.0
PV-S5	4/13/2010	0843	245128	329157	0.9	13.8
PV-S6	4/13/2010	0909	244995	329250	1.8	6.0
PV-S7	4/13/2010	0940	244951	329143	0.8	10.0
PV-S8	4/13/2010	0957	245055	329106	1.6	5.0
PV-S9	4/13/2010	1007	245016	329089	1.7	10.0
PV-S10	4/13/2010	1015	245029	329157	1.5	6.0
PV-S11	4/13/2010	1033	245072	329184	2.0	13.5
PV-S12	4/13/2010	1054	244910	329235	1.5	6.5
PV-S13	4/13/2010	1244	244840	329152	0.9	7.0
PV-S14	4/13/2010	1254	244944	328977	1.8	11.8
PV-S15	4/13/2010	1310	244933	329033	2.3	10.5
PV-S16	4/13/2010	1326	244904	329112	1.6	3.5
PV-S17	4/13/2010	1346	244875	328992	1.1	8.5
PV-S18	4/13/2010	1412	244826	329015	1.1	8.0
PV-S19	4/13/2010	1428	244251	329160	1.4	4.5

TABLE 2-1 (continued)

Location ID	Date	Time	Northing (ft) New Jersey, NAD 83	Easting (ft) New Jersey, NAD 83	Water Depth (ft)	Recovery Depth (in)
Shoreline Locations						
PV-S20	4/14/2010	0829	244785	328994	0.6	13.5
PV-S21	4/14/2010	0843	244766	329027	1.1	9.3
PV-S22	4/14/2010	0901	244741	328977	2.1	13.2
PV-S23	4/14/2010	0930	244841	329063	2.0	9.8
PV-S24	4/14/2010	0939	244806	329092	2.0	10.0
PV-S25	4/14/2010	0957	244731	329169	1.1	7.0
PV-S26	4/14/2010	1011	244749	329071	1.2	13.0
PV-S27	4/14/2010	1033	244655	329099	1.0	9.0
PV-S28	4/14/2010	1050	244637	328945	0.5	11.0
PV-S29	4/14/2010	1113	244702	328953	1.6	10.3
PV-S30	4/14/2010	1127	244738	328912	1.3	5.3
PV-S31	4/14/2010	1148	244953	329143	0.7	4.0
PV-S32	4/14/2010	1208	244707	323910	1.6	3.0
PV-S33	4/14/2010	1241	244669	328828	1.1	8.0
PV-S34	4/14/2010	1251	244606	328922	1.1	9.5
PV-S35	4/14/2010	1300	244632	328911	0.8	7.0
PV-S36	4/14/2010	1314	244526	328831	0.1	6.0
PV-S37	4/14/2010	1324	244488	328843	0.0	8.5
PV-S38	4/14/2010	1336	244452	328910	0.8	7.5
PV-S39	4/14/2010	1350	244579	328966	1.2	7.0
PV-S40	4/14/2010	1358	244527	328956	1.1	10.0
PV-S41	4/14/2010	1413	244489	328983	1.5	7.0
PV-S42	4/14/2010	1432	244352	328917	0.6	3.5
PV-S43	4/14/2010	1438	244372	328895	1.5	8.0

TABLE 2-2. PHASE V SAMPLING - DUPLICATE AND MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES

Duplicate Number	Sample ID
PV-DUP1	PV-S29-A
PV-DUP2	PV-S40-B
PV-DUP3	PV-S37-A
PV-DUP4	PV-S20-A
PV-DUP5	PV-S4-B
PV-DUP6	PV-S27-A
PV-DUP7	PV-S36-A
PV-DUP8	PV-R22-A
PV-DUP9	PV-S5-B
PV-DUP10	PV-R11-B

MS/MSD Sample IDs
PV-S40-A-MS/MSD
PV-S28-A-MS/MSD
PV-S20-B-MS/MSD
PV-S27-B-MS/MSD
PV-S36-A-MS/MSD
PV-R22-B-MS/MSD
PV-R10-B-MS/MSD
PV-R11-A-MS/MSD

3. RESULTS

Results of sediment and soil sampling for Phase V are presented in Tables 3-1 and 3-2 and Figures 3-1 and 3-2. The following sections discuss the arsenic results for sediment and soil samples.

3.1 SEDIMENT (River)

Twenty-three (23) locations were sampled in the Maurice River. Upon completion of sampling and core processing, 31 sediment samples were submitted for arsenic analysis (Tables 3-1 and 3-2). Twenty-three sediment samples represented 0 inches to 6 inches below sediment surface depth intervals (Table 3-1 and Figure 3-1) and 8 sediment samples represented 6 inches to 12 inches below sediment surface depth interval (Table 3-2 and Figure 3-2).

Table 3-1 lists the sediment sample arsenic concentrations for 0 inches to 6 inches below sediment surface depth interval; Figure 3-1 depicts the results for the same depth interval. Seventeen (17) sediment samples from 0 inches to 6 inches had detected concentrations of arsenic (77.3%). Detected arsenic concentrations ranged from 0.91 mg/Kg to 500 mg/Kg. Two sediment samples (9.1%) exceeded the Site Clean-up Level. The two samples that exceeded 20 ppm were at location PV-R19 and PV-R20 (Table 3-1 and Figure 3-1). Sample PV-R19-A had an arsenic concentration of 64 mg/Kg which exceeded the Site Clean-up Level by a factor of 3.2. Sample PV-R20-A had an arsenic concentration of 500 mg/Kg which exceeded the Site Clean-up Level by a factor of 25.

Table 3-2 lists the sediment sample arsenic concentrations for 6 inches to 12 inches below sediment surface depth interval; Figure 3-2 depicts the results for the same depth interval. Sediments in the Maurice River were comprised mostly of medium-to-coarse sands thus resulting in sediment core recoveries that were less than 12 inches. Five of 8 (62.5%) sediment samples from the 6 inches to 12 inches depth interval had detected concentrations of arsenic. Concentrations of detected arsenic ranged from 1.5 mg/Kg to 28 mg/Kg. One sample, PV-R3-B, exceeded the Site Clean-up Level of 20 ppm with an arsenic concentration of 28; this exceeded the Site Clean-up Level by a factor of 1.4.

3.2 SOIL (Shoreline)

Forty-three (43) locations were sampled along the shoreline of the Maurice River. Sixty-four soil samples taken along the shorelines of the Maurice River were submitted for analysis. Of the 64 samples submitted, 43 soil samples represented 0 inches to 6 inches below soil surface (Table 3-1 and Figure 3-1) and 21 soil samples represented 6 inches to 12 inches below soil surface (Table 3-2 and Figure 3-2).

For the 0 inches to 6 inches depth interval (Table 3-1 and Figure 3-1), 39 of the soil samples had detected concentrations of arsenic (90.7%) and 23 soil samples (53.5%) exceeded the Site Clean-up Level. Detected arsenic concentrations in the soil samples ranged from 1.9 mg/Kg to 820 mg/Kg. Arsenic concentrations in samples exceeding the Site Clean-up Level ranged from 21 mg/Kg to 820 mg/Kg.

Twenty-one (21) soil samples taken from 6 inches to 12 inches below the soil surface were submitted for arsenic analysis (Table 3-2 and Figure 3-2). Arsenic was detected in 13 samples (61.9%) with concentrations ranging from 2.6 mg/Kg to 400 mg/Kg. Four soil samples exceeded the Site Clean-up Level (19%) with concentrations ranging from 61 mg/Kg to 400 mg/Kg.

3.3 QA/QC RESULTS

The results for the QA/QC samples, including field duplicates and matrix spike and matrix spike duplicates, are provided in Table 3-3 and are discussed in the following subsections.

3.3.1 Field Duplicates

Field duplicate samples were collected simultaneously from the same sampling locations as sediment and soil samples.

Relative percent differences (RPD) were calculated for field duplicate samples that had detected concentrations of arsenic. Following the protocol defined in Worksheet 12 of the *UFP/QAPP* (USACE 2009), the RPD was calculated for PV-DUP1, -DUP2, -DUP3, -DUP4, -DUP6, and DUP10. RPDs were not calculated for duplicates and co-located samples with non-detect results. According to the *UFP/QAPP* (USACE 2009), the measurement performance criterion for sediment samples and soil samples is 25% RPD (QAPP Worksheets 12-1 and 12-2).

Table 3-3 lists the RPD results for duplicate samples with detected concentrations of arsenic. The RPDs for PV-DUP2 and PV-DUP3 were in compliance (less than 25%). The RPDs for PV-DUP1, -DUP4, -DUP6, and –DUP10 were greater than 25%. The difference in arsenic concentrations between these duplicates and their respective samples may be due to the heterogeneity of the sediments and soils in the Maurice River.

3.3.2 MS/MSD Samples

Results of the MS/MSD samples are presented in Table 3-3. The Laboratory's established QC criteria were met for MS and MSD samples, including sediment and soil samples. These data were validated by the USEPA Region II DESA Laboratory.

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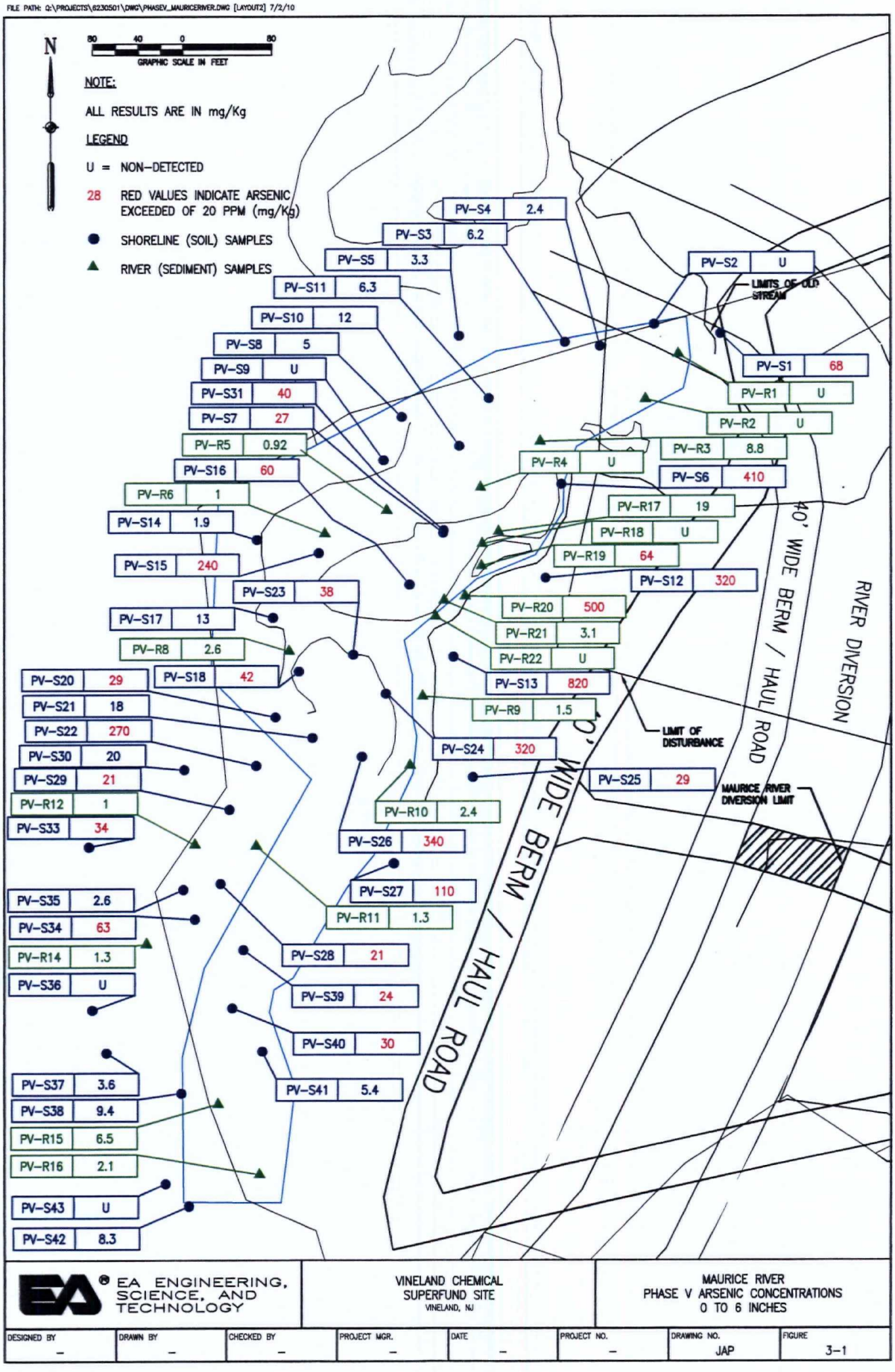

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

VINELAND CHEMICAL SUPERFUND SITE
VINELAND, NJ

MAURICE RIVER
PHASE V ARSENIC CONCENTRATIONS
0 TO 6 INCHES

DESIGNED BY	DRAWN BY	CHECKED BY	PROJECT MGR.	DATE	PROJECT NO.	DRAWING NO.	FIGURE
-	-	-	-	-	-	JAP	3-1

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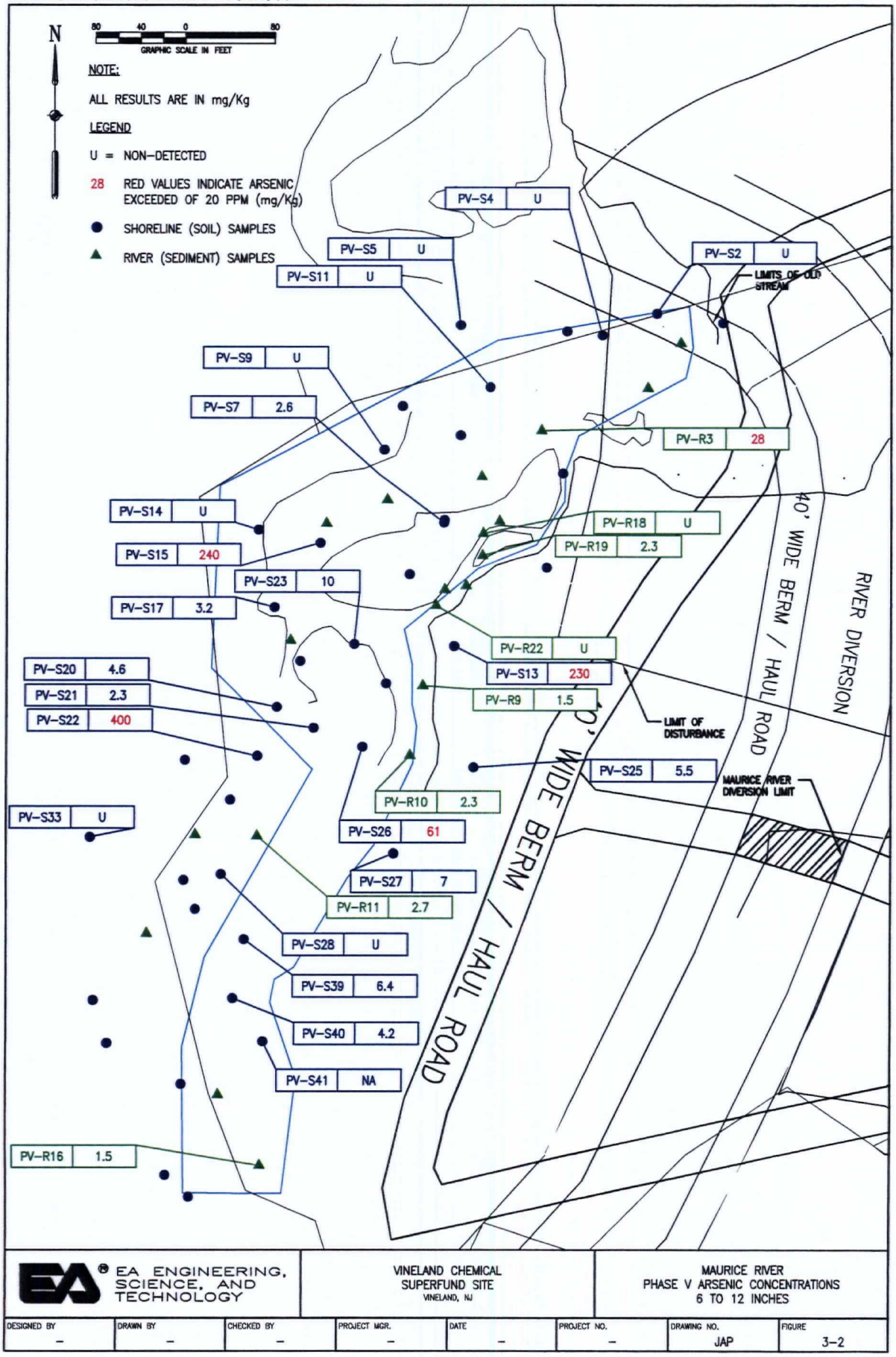

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

VINELAND CHEMICAL SUPERFUND SITE
VINELAND, NJ

MAURICE RIVER
PHASE V ARSENIC CONCENTRATIONS
6 TO 12 INCHES

DESIGNED BY	DRAWN BY	CHECKED BY	PROJECT MGR.	DATE	PROJECT NO.	DRAWING NO.	FIGURE
-	-	-	-	-	-	JAP	3-2

TABLE 3-1. PHASE V ARSENIC RESULTS - 0 INCHES TO 6 INCHES DEPTH

Sediment (river) samples

Sample ID	Units	Result
PV-R1-A	mg/KG	0.85 U
PV-R2-A	mg/KG	0.94 U
PV-R3-A	mg/KG	**8.8**
PV-R4-A	mg/KG	0.68 U
PV-R5-A	mg/KG	**0.92**
PV-R6-A	mg/KG	**1**
PV-R7-A	mg/KG	**0.91**
PV-R8-A	mg/KG	**2.6**
PV-R9-A	mg/KG	**1.5**
PV-R10-A	mg/KG	**2.4**
PV-R11-A	mg/KG	**1.3**
PV-R12-A	mg/KG	**1**
PV-R13-A	mg/KG	**0.96**
PV-R14-A	mg/KG	**1.3**
PV-R15-A	mg/KG	**6.5**
PV-R16-A	mg/KG	**2.1**
PV-R17-A	mg/KG	**19**
PV-R18-A	mg/KG	2.9 U
PV-R19-A	mg/KG	**64**
PV-R20-A	mg/KG	**500**
PV-R21-A	mg/KG	**3.1**
PV-R22-A	mg/KG	1.5 U
PV-R23-A	mg/KG	0.75 U

Soil (shoreline) samples

Sample ID	Units	Result
PV-S1-A	mg/KG	**68**
PV-S2-A	mg/KG	1.1 U
PV-S3-A	mg/KG	**6.2**
PV-S4-A	mg/KG	**2.4**
PV-S5-A	mg/KG	**3.3**
PV-S6-A	mg/KG	**410**
PV-S7-A	mg/KG	**27**
PV-S8-A	mg/KG	**5**
PV-S9-A	mg/KG	2.1 U
PV-S10-A	mg/KG	**12**
PV-S11-A	mg/KG	**6.3**
PV-S12-A	mg/KG	**320**
PV-S13-A	mg/KG	**820**
PV-S14-A	mg/KG	**1.9**
PV-S15-A	mg/KG	**240**
PV-S16-A	mg/KG	**60**
PV-S17-A	mg/KG	**13**
PV-S18-A	mg/KG	**42**
PV-S19-A	mg/KG	**240**
PV-S20-A	mg/KG	**29**
PV-S21-A	mg/KG	**18**
PV-S22-A	mg/KG	**270**
PV-S23-A	mg/KG	**38**
PV-S24-A	mg/KG	**320**
PV-S25-A	mg/KG	**29**
PV-S26-A	mg/KG	**340**
PV-S27-A	mg/KG	**110**
PV-S28-A	mg/KG	**21**
PV-S29-A	mg/KG	**21**
PV-S30-A	mg/KG	**20**
PV-S31-A	mg/KG	**40**
PV-S32-A	mg/KG	**16**
PV-S33-A	mg/KG	**34**
PV-S34-A	mg/KG	**63**
PV-S35-A	mg/KG	**2.6**
PV-S36-A	mg/KG	0.77 U
PV-S37-A	mg/KG	**3.6**
PV-S38-A	mg/KG	**9.4**
PV-S39-A	mg/KG	**24**
PV-S40-A	mg/KG	**30**
PV-S41-A	mg/KG	**5.4**
PV-S42-A	mg/KG	**8.3**
PV-S43-A	mg/KG	0.87 U

NOTE: **Bold** values represent detected arsenic concentrations; shaded values exceed the Site Clean-up Level of 20 mg/Kg (ppm)

U=arsenic was analyzed, but not detected. Average reporting limits are listed next to non-detected sample results.

TABLE 3-2. PHASE V ARSENIC RESULTS - 6 INCHES TO 12 INCHES DEPTH

Sediment (river) samples

Sample ID	Units	Result
PV-R3-B	mg/KG	**28**
PV-R10-B	mg/KG	**2.3**
PV-R11-B	mg/KG	**2.7**
PV-R16-B	mg/KG	**1.5**
PV-R18-B	mg/KG	1.5 U
PV-R19-B	mg/KG	**2.3**
PV-R22-B	mg/KG	0.77 U
PV-R23-B	mg/KG	0.81 U

Soil (shoreline) samples

Sample ID	Units	Result
PV-S2-B	mg/KG	0.93 U
PV-S4-B	mg/KG	1.1 U
PV-S5-B	mg/KG	0.92 U
PV-S7-B	mg/KG	**2.6**
PV-S9-B	mg/KG	0.82 U
PV-S11-B	mg/KG	0.99 U
PV-S13-B	mg/KG	**250**
PV-S14-B	mg/KG	0.71 U
PV-S15-B	mg/KG	**240**
PV-S17-B	mg/KG	**3.2**
PV-S20-B	mg/KG	**4.6**
PV-S21-B	mg/KG	**2.3**
PV-S22-B	mg/KG	**400**
PV-S23-B	mg/KG	**10**
PV-S25-B	mg/KG	**5.5**
PV-S26-B	mg/KG	**61**
PV-S27-B	mg/KG	**7**
PV-S28-B	mg/KG	0.77 U
PV-S33-B	mg/KG	0.9 U
PV-S39-B	mg/KG	**6.4**
PV-S40-B	mg/KG	**4.2**

NOTE: **Bold** values represent detected arsenic concentrations; shaded values exceed the Site Clean-up Level of 20 mg/Kg (ppm)

U=arsenic was analyzed, but not detected. Laboratory reporting limits are listed next to non-detect qualifier.

TABLE 3-3. ARSENIC CONCENTRATIONS (mg/Kg) IN PHASE V SAMPLING - DUPLICATE AND MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES

Duplicate Number	Units	Average RL	Duplicate Result	Sample ID	Average RL	Sample Result	RPD (%)
PV-DUP1	mg/Kg		14	PV-S29-A		20	40.0
PV-DUP2	mg/Kg		4.9	PV-S40-B		4.2	15.4
PV-DUP3	mg/Kg		4.2	PV-S37-A		3.6	15.4
PV-DUP4	mg/Kg		21	PV-S20-A		29	32.0
PV-DUP5	mg/Kg	0.97	U	PV-S4-B	1.1	U	NC
PV-DUP6	mg/Kg		138	PV-S27-A		110	97.3
PV-DUP7	mg/Kg		1.1	PV-S36-A	0.77	U	NC
PV-DUP8	mg/Kg	1.5	U	PV-R22-A	1.5	U	NC
PV-DUP9	mg/Kg	0.95	U	PV-S5-B	0.92	U	NC
PV-DUP10	mg/Kg		1.8	PV-R11-B		2.7	40.0

MS/MSD Sample IDs	Units	Average RL	MS/MSD Result	Sample ID	Average RL	Sample Result
PV-S40-A-MS	mg/Kg		51	PV-S40-A		30
PV-S40-A-MSD	mg/Kg		26	PV-S40-A		30
PV-S28-A-MS	mg/Kg		25	PV-S28-A		21
PV-S28-A-MSD	mg/Kg		20	PV-S28-A		21
PV-S20-B-MS	mg/Kg		5.3	PV-S20-B		4.6
PV-S20-B-MSD	mg/Kg		4.7	PV-S20-B		4.6
PV-S27-B-MS	mg/Kg		7.7	PV-S27-B		7
PV-S27-B-MSD	mg/Kg		8.1	PV-S27-B		7
PV-S36-A-MS	mg/Kg		1.2	PV-S36-A	0.77	U
PV-S36-A-MSD	mg/Kg	0.79	U	PV-S36-A	0.77	U
PV-R22-B-MS	mg/Kg	0.77	U	PV-R22-B	0.77	U
PV-R22-B-MSD	mg/Kg	0.74	U	PV-R22-B	0.77	U
PV-R10-B-MS	mg/Kg		2.5	PV-R10-B		2.3
PV-R10-B-MSD	mg/Kg		2	PV-R10-B		2.3
PV-R11-A-MS	mg/Kg		1.2	PV-R11-A		1.3
PV-R11-A-MSD	mg/Kg		1.4	PV-R11-A		1.3

RL=laboratory reporting limit (average)
NOTE: Bold values represent detected arsenic concentrations; shaded values exceed the Site Clean-up Level of 20 mg/Kg (ppm)
U=arsenic was analyzed, but not detected
RPD=relative percent difference (see Section 3.3.1 for description of calculation)
NC=not calcuated due to non-detected results

4. REFERENCES

U.S. Army Corps of Engineers (USACE). 1994. *Requirements for Preparation of Sampling and Analysis Plans.* USACE Engineer Manual. EM 200-1-3. 01 September 2004.

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U.S. Environmental Protection Agency (USEPA). 2001. *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual.* EPA-823-B-01-002.

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APPENDIX A

ANALYTICAL RESULTS, CHAIN-OF-CUSTODY (COC) FORMS FOR ARSENIC ANALYSES, AND FIELD DOCUMENTATION (LOGBOOK)

12 APRIL 2010

VINELAND - Phase V Sediment Sampling

1100 - T. Ward and Adam Kuzma
Arrive @ Alliance Beach, unload equipment

1130 - 1140 - flag north and south ends of study area, islands 1, 2a, 2b, and 3

1145 - sample @ PV-R1
N 245111.5 ft NJ NAD83
E 329354.0 ft
Depth = 4.0 ft
Recovery = 0.75 ft tan sand

1255 - PV-R2
N 245071.0 ft E ~~329337~~ 329325.4 ft
D: 5.6 ft Rec. = 3 inches hard-packed tan sand

1309 - PV-R3
N 245033.0 E 329230.3
D: 2.9 ft Rec. = ~ 8 in. Brown peat, tan sand

1324 - PV-R4
N 244991.8 E 329176.4
D: 5.0 ft Rec. = 2 inches Coarse sand, gravel

12 April 2010

1344 - PV-R5
N 244970.9 E 329092.4
D: 4.8 ft Rec. = ~ 8 inches Tan sand

1419 - PV-R6
N 244949.9 E 329038.3
D: 5.2 ft Rec. = ft 3/4 in. Tan sand

1471 PV-R7
N 244896.2 E 329022.8
D: 4.8 ft Rec. = 2.5 in. Gravel / coarse sand

1452 - PV-R8
N 244844.5 E 329066.4
D: 4.8 ft Rec. = ~ 3 inches gravel, sand

1505 - PV-R9
N 244804.0 E 329124.2
D: 5.0 ft Rec. = 4 inches gravel, sand

~~1530~~ 1503 - PV-R10
N 244741.6 E 329113.1
D: 4.7 ft Rec. = 17 in. sand, gravel

12 April 2010

1625 - PV-R11
N 244670.2 E 328977.1
D: 4.8 ft Rec. = 17 in. Sand, gravel

1641 - PV-R12
N 244671.3 E 328921.9
D: 5.7 ft Rec = 3 in. Hard packed sand

1653 - PV-R13
N 244664.7 E 328882.8 ft
D = 5.3 ft Rec = 5 in. Sand, gravel

1708 - PV-R14
N 244584.3 E 328878.3
D = 3.2 ft Rec = 7.5 in. Sand gravel

1724 - PV-R15
N ~~244442.7~~ TV E ~~328946.4~~ TV
D = 4.2 ft Rec = 8.6 inches
N 244442.7 E 328942.9

1738 - PV-R11c
N 244380.2 E 328900.2
D = 6.3 ft Rec =

13 APRIL 2010
VINELAND PHASE V SEDIMENT SAMPLING
ORC - T. WARD & A. KUMM ARCHIVE
ALLIANCE BEACH, UNCAS-90
EQUIPMENT

0745 PV-S1
N 245130.0 E 329390.8
D = 1.3 ft Rec = 7 in. Sandy silt

0757 PV-S2
N 245138.6 E 329332.7
D = 1.7 ft Rec = 8 in brown sandy silt w/ roots

0813 PV-S3
N 245122.5 E 329252.8
D = 1.6 ft Rec = 6 in brown silt w/ peat and roots

0825 PV-S4
N 245118.9 E 329284.3
D = 1.3 ft Rec = 10 in sand w/ roots mats and peat

13 APRIL 2010

0843 PV-S5
N 245128.2 E 329156.9
D = 0.9 ft Rec = 13.8 ft silt w/ sand and root mass

0904 PV-S6
D = 1.8 ft Rec = 6 in silt and peat
N 244944.7 E 329249.5

0940 PV-S7
N 244950.7 E 329142.5
D = 0.8 ft Rec = 10 in silty sand w/ roots

0957 PV-S8
N 245055.1 E 329105.5
D = 1.6 ft Rec = 5 in silt and peat

1007 PV-S9
N 245016.0 E 329087.4
D = 1.7 ft Rec = 10 in rocks and silt w/ white sand at btm

1015 PV-S10
N 245028.9 E 329157.0
D = 1.5 ft Rec = 6 in brown clayey silt

13 APRIL 2010

1033 PV-S11
N 245092.1 E 329163.7
D = 7.0 ft Rec = 13.8 ft silt w/ roots and sand at bottom

1054 PV-S12
N 244910.2 E 329235.0
D = 1.5 ft Rec = 6.5 in brown silt w/ root material

1109 PV-R17
N 244951.86 E 329192.6
D = 4.4 ft Rec = 5.5 in dark to sand

1119 PV-R18
N 244941.69 E 329177.88
D = 8.4 ft Rec = 9.5 in peat w/ sand

1130 PV-R19
N 244921.9 E 329177.2
D = 2.0 ft Rec = 12.5 in sand w/ root and silt

13 APRIL 2010

1146 PV-R20
N 244993.8 E 329162.4
D = 1.7 ft Rec = 4 in peat w/ root mass

1157 PV-R21
N 244890.3 E 329143.6
D = 3.6 ft Rec = 6 in tan sand

1216 PV-R22
N 244875.8 E 329135.8
D = 5.0 ft Rec = 15 in peat and silt

1244 PV-S13
N 244889.5 E 329151.8
D = 0.9 ft Rec = 7 in silt w/ ~~peat~~ and root wad

1254 PV-S14
N 244944.4 E 328977.4
D = 1.8 Rec = 11.8 in silt w/ peat and some sand

13 APRIL 2010

1310 PV-S15
N 244932.5 E 329082.6
D = 2.8 ft Rec = 10.5 in silt and peat

1326 PV-S16
N 244904.2 E 329112.3
D = 1.6 ft Rec = 3.5 in peat w/ silt

1346 PV-S17
N 244874.5 E 328994.8
D = 1.1 ft Rec = 8.5 in clayey silt w/ root wads

1402 PV-S18
N 244826.2 E 329015.6
D = 1.1 ft Rec = 8 in silt and peat

1428 PV-S19
N 244756.0 E 329159.8
D = 1.4 ft Rec = 4.5 in silt and peat

14 APRIL 2016

0710 VINELAND PHASE V SEDIMENT SAMPLING

T. ~~WARD~~ AND A. KUHN ARRIVE @ ALLIANCE BEACH, UNLOAD EQUIPMENT

0829 PV-S20
N 244784.8 E 328994.1
D = 0.6 ft Rec = 13.5 in brown silt and peat w/ wood chunks

0843 PV-S21
N 244766.1 E 329027.1
D = 1.1 ft Rec = 9.3 in brown silt w/ peat

0901 PV-R23
N 244741.2 E 328976.9
D = 2.1 ft Rec = 13.2 in silt w/ peat and sand

0930 PV-S22
N 244841.4 E 329063.03
D = 2.0 ft Rec = 9.8 in brown silt w/ sand

14 APRIL 2016

0939 PV-S23
N 244806.1 E 329091.6
D = 2.0 ft Rec = 10 in some peat w/ fine sand and silt

0957 PV-S24
N 244731.2 E 329169.4
D = 1.1 ft Rec = 7 in silt w/ little sand and phragmites

1011 PV-S25
N 244749.3 E 329070.6
D = 1.2 ft Rec = 18 in brown silt w/ fine sand; some peat

1033 PV-S26
N 244655.0 E 329098.7
D = 1.0 ft Rec = 9 in brown silt and peat

1050 PV-S27
N 244636.9 E 328945.0
D = 0.5 ft Rec = 11 in brown silt and peat

14 APRIL 2010

1113 PV-528
N 244702.4 E 328953.0
D = 1.6 ft REC: 10.3 silt and peat w/ some fine sand

1127 PV-529
N 244737.7 E 328912.2
D = 1.3 ft REC = 5.3 in silt and peat

1148 PV-530
N 244953.0 E 329142.9
D = 0.7 ft REC = 4 in silt and sand

1208 PV-531
N 244706.9 E 328909.9
D = 1.6 ft REC = 8 in silt and peat

1241 PV-532
N 244669.4 E 328827.8
D = 1.1 ft REC = 8.0 in silt and peat

1251 PV-533
N 244605.9 E 328921.8
D = 1.1 ft REC = 9.5 in peat and silt w/ sand and bottom

14 APRIL 2010

1300 PV-534
N 244631.7 E 328911.3
D = 0.8 ft REC = 7 in peat and silt

1314 PV-535
N 244525.6 E 328930.7
D = 0.1 ft REC = 6 in silt and sand

1324 PV-536
N 244487.8 E 328843.1
D = 0 ft REC = 8.6 in silt and little sand

1336 PV-537
N 244451.8 E 328909.6
D = 0.8 ft REC = 7.5 in sand and root mass

1350 PV-538
N 244579.3 E 328965.6
ΔD = 1.2 REC = 7.0 in ~~sand~~ w/ roots and peat

1358 PV-539
N 244527.3 E 328955.7
D = 1.1 ft REC = 10 in sand w/ roots and peat

14 APRIL 2010

1406 PV-540
N 244516.2 E 328969.1
D= 1.0 ft Rec= 11.5in sand w/ roots and peat

1413 PV-541
N 244489.2 E 328982.7
D= 1.6 ft Rec= 7.0 in sand w/ little peat

1432 PV-542
N 244352.3 E 328916.5
D = 0.6 ft Rec= 3.5 in sand w/ peat

1438 PV-543
N ~~244385.~~ 244371.8 E 328895.2
D = 1.5 ft Rec = 8 in peat and sand

15 APRIL 2010

VINELAND PHASE V Sediment Processing

Sample ID's: location - A : 0"-6"
location - B = 6"-12"

Sample ID	Time
PV-S29-A	1035
↳ ~~PV-S29-B~~ PV-DUP1	"
PV-S26-A	1045
PV-S26-B	1046
PV-S32-A	1058
PV-S39-A	1105
PV-S39-B	1106
PV-S25-A	1115
PV-S25-B	1116
PV-S40-A	1130
PV-S40-A-MS	1130
PV-S40-A-MSD	1130
PV-S40-B	1131
↳ PV-DUP2	"

Vineland

15 April 2010 Phase V Sed. Processing

Sample ID	Time
PV-S38-A	1140
PV-S30-A	1155
PV-S31-A	1157
PV-S24-A	1204
PV-S41-A	1206
PV-S37-A	1212
↳ PV-DUP3	"
PV-S42-A	1215
PV-S28-A	1222
PV-S28-B	1223
↳ PV-S28-A-MS	1222
PV-S28-A-MSD	1222
PV-S35-A	1245
PV-R18-A	1255
PV-R18-B	1256

Vineland

15 APRIL 2010 Phase V Sed. Processing

Sample ID	Time
PV-S23-A	1317
PV-S23-B	1318
PV-S43-A	1325
~~PV-S43-B 1326~~ TW	
PV-R1-A	1330
PV-S23-A	1340
PV-S23-B	1341
PV-S16-A	1345
PV-R19-A	1355
PV-R19-B	1356
PV-S20-A	1405
↳ PV-DUP4	"
PV-S20-B	1410
PV-S20-B-MS	1410
PV-S20-B-MSD	1410
PV-S13-A	1420
PV-S13-B	1421

Vineland Phase V Sed. Processing

15 APRIL 2010

Sample ID	Time
PV-S15-A	1435
PV-S15-B	1436
PV-R7-A	1440
PV-R15-A	1442
PV-R8-A	1446
PV-R16-A	1450
PV-R16-B	1451
PV-S21-A	1505
PV-S21-B	1506
PV-S4-A	1515
PV-S4-B	1516
↳ PV-DUP5	"
PV-R4-A	1522

16 April 2010

Sample ID	Time
PV-S22-A	0925
PV-S22-B	0926
PV-S27-A	0935
↳ PV-DUP6	
PV-S27-B	0936
PV-S27-B-MS	0936
PV-S27-B-MSD	0936
PV-S33-A	0950
PV-S33-B	0950 TW
PV-R21-A	0957
PV-S34-A	1000
PV-S6-A	1009
PV-S3-A	1015
PV-S36-A	1020
↳ PV-DUP7	
PV-S36-A-MS	1020
PV-S36-A-MSD	1020

16 APRIL 2010

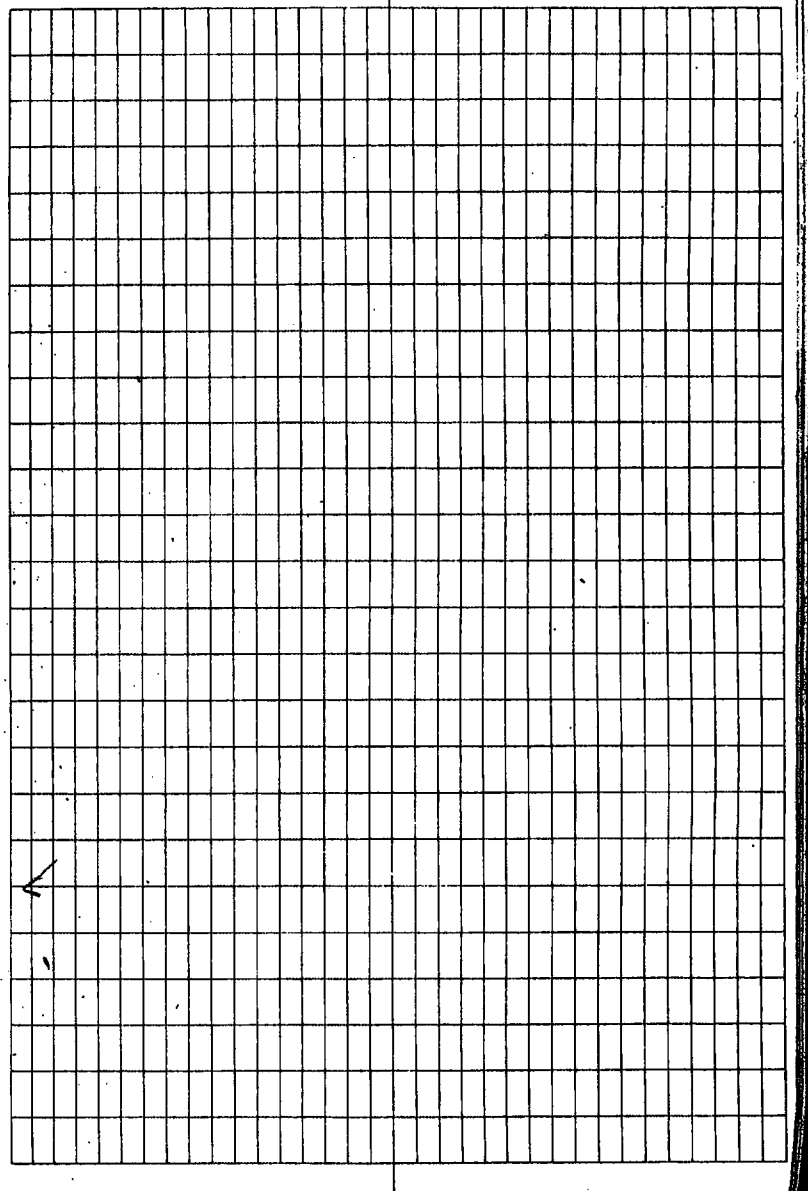
Sample ID	Time
PV-S17-A	1106
PV-S17-B	1109
PV-S19-A	1113
PV-R9-A	1117
PV-R13-A	1123
PV-R5-A	1125
PV-R6-A	1127
PV-R12-A	1140
PV-S8-A	1142
PV-R20-A	1144
PV-R22-A	1230
↳ PV-DUP8	"
PV-R22-B	1235
PV-R22-B-MS	1235
PV-R22-B-MSD	1235

16 APRIL 2010

Sample ID	Time
PV-R2-A	1245
PV-~~R2~~ R14-A	1247
PV-R17-A	1249
PV-S1-A	1300
PV-S10-A	1302
PV-S12-A	1304
PV-S2-A	1310
PV-S2-B	1312
PV-S9-A	1315
PV-S9-B	1317
PV-S5-A	1325
PV-S5-B	1327
↳ PV-DUP9	"
PV-R10-A	1335
PV-R10-B	1337
PV-R10-B-MS	1337
PV-R10-B-MSD	1337

16 APRIL 2010

Sample ID	Time
PV-S11-A	1342
PV-S11-B	1344
PV-R3-A	1347
PV-R3-B	1349
PV-S14-A	1355
PV-S14-B	1357
PV-R11-A	1400
PV-R11-A-MS	1400
PV-R11-A-MSD	1400
PV-R11-B	1402
↳ PV-DUP10	"
PV-S7-A	1408
PV-S7-B	1410
PV-S18-A	1415



Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Peggy Derrick**
	Phone: 410-329-5126
15 Loveton Circle	Field Contact:
Sparks, MD 21152	Todd Ward
	Phone: 410-746-1250

Project Name: Vineland Phase V sediment sampling

Project#: 62305.01

Page 1 of 7

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Arsenic EPA 200.7/6010B	Remarks
4/15/10	1035		X	PV-S29-A	1	X	
			X	PV-DUP1	1	X	Note: 28 day TAT required
4/15/10	1045		X	PV-S26-A	1	X	
4/15/10	1046		X	PV-S26-B	1	X	
4/15/10	1058		X	PV-S32-A	1	X	
4/15/10	1105		X	PV-S39-A	1	X	
4/15/10	1106		X	PV-S39-B	1	X	
4/15/10	1115		X	PV-S25-A	1	X	
4/15/10	1116		X	PV-S25-B	1	X	
4/15/10	1130		X	PV-S40-A	1	X	
4/15/10	1130		X	PV-S40-A-MS	1	X	
4/15/10	1130		X	PV-S40-A-MSD	1	X	
4/15/10	1131		X	PV-S40-B	1	X	
			X	PV-DUP2	1	X	
4/15/10	1140		X	PV-S38-A	1	X	
4/15/10	1155		X	PV-S30-A	1	X	
4/15/10	1157		X	PV-S31-A	1	X	
4/15/10	1204		X	PV-S24-A	1	X	

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
USEPA
Region 2 Laboratory
2890 Woodbridge Ave.
Edison, NJ 08837

Phone: 732-906-6886

ATTN: Mr. John Birri/John Bourbon

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Todd Ward	4/16/10 1430	Todd Ward	4/16/10 1700
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Peggy Derrick**
	Phone: **410-329-5126**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Todd Ward**
	Phone: **410-746-1250**

Project Name: Vineland Phase V sediment sampling

Project#: 62305.01

Page 2 of 7

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Arsenic EPA 200.7/6010B
4/15/10	1206		X	PV-S41-A	1	X
4/15/10	1212		X	PV-S37-A	1	X
			X	PV-DUP3	1	X
4/15/10	1215		X	PV-S42-A	1	X
4/15/10	1222		X	PV-S28-A	1	X
4/15/10	1222		X	PV-S28-A-MS	1	X
4/15/10	1222		X	PV-S28-A-MSD	1	X
4/15/10	1223		X	PV-S28-B	1	X
4/15/10	1245		X	PV-S35-A	1	X
4/15/10	1255		X	PV-R18-A	1	X
4/15/10	1256		X	PV-R18-B	1	X
4/15/10	1317		X	PV-R23-A	1	X
4/15/10	1318		X	PV-R23-B	1	X
4/15/10	1325		X	PV-S43-A	1	X
4/15/10	1330		X	PV-R1-A	1	X
4/15/10	1340		X	PV-S23-A	1	X
4/15/10	1341		X	PV-S23-B	1	X
4/15/10	1345		X	PV-S16-A	1	X

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
USEPA
Region 2 Laboratory
2890 Woodbridge Ave.
Edison, NJ 08837

Phone: 732-906-6886

ATTN: Mr. John Birri/John Bourbon

Remarks

Note: 28 day TAT required

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Todd Ward	4/16/10 1430	Todd Ward	4/16/10 1700
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Peggy Derrick**
	Phone: **410-329-5126**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Todd Ward**
	Phone: **410-746-1250**

Project Name: Vineland Phase V sediment sampling

Project#: 62305.01

Page 3 of 7

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Arsenic EPA 200.7/6010B	Remarks
4/15/10	1355		X	PV-R19-A	1	X	
4/15/10	1356		X	PV-R19-B	1	X	Note: 28 day TAT required
4/15/10	1405		X	PV-S20-A	1	X	
			X	PV-DUP4	1	X	
4/15/10	1410		X	PV-S20-B	1	X	
4/15/10	1410		X	PV-S20-B-MS	1	X	
4/15/10	1410		X	PV-S20-B-MSD	1	X	
4/15/10	1420		X	PV-S13-A	1	X	
4/15/10	1421		X	PV-S13-B	1	X	
4/15/10	1435		X	PV-S15-A	1	X	
4/15/10	1436		X	PV-S15-B	1	X	
4/15/10	1440		X	PV-R7-A	1	X	
4/15/10	1442		X	PV-R15-A	1	X	
4/15/10	1446		X	PV-R8-A	1	X	
4/15/10	1450		X	PV-R16-A	1	X	
4/15/10	1451		X	PV-R16-B	1	X	
4/15/10	1505		X	PV-S21-A	1	X	
4/15/10	1506		X	PV-S21-B	1	X	

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
USEPA
Region 2 Laboratory
2890 Woodbridge Ave.
Edison, NJ 08837

Phone: 732-906-6886

ATTN: Mr. John Birri/John Bourbon

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Todd Ward	4/16/10 1430	Todd Ward	4/16/10 1700
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time

Client:	Project Manager:	Parameters/Method Numbers for Analysis	Chain of Custody Record
EA Engineering Science, and Technology, Inc.	**Peggy Derrick**		Laboratory:
	Phone: **410-329-5126**		**USEPA**
15 Loveton Circle	Field Contact:		**Region 2 Laboratory**
Sparks, MD 21152	**Todd Ward**		**2890 Woodbridge Ave.**
	Phone: **410-746-1250**		**Edison, NJ 08837**
Project Name: Vineland Phase V sediment sampling			**Phone: 732-906-6886**
Project#: 62305.01			**ATTN: Mr. John Birri/John Bourbon**
Page 4 of 7			

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Arsenic EPA 200.7/6010B	Remarks
4/15/10	1515		X	PV-S4-A	1	X	
4/15/10	1516		X	PV-S4-B	1	X	**Note: 28 day TAT required**
			X	PV-DUP5	1	X	
4/15/10	1522		X	PV-R4-A	1	X	
4/16/10	925		X	PV-S22-A	1	X	
4/16/10	926		X	PV-S22-B	1	X	
4/16/10	935		X	PV-S27-A	1	X	
			X	PV-DUP6	1	X	
4/16/10	936		X	PV-S27-B	1	X	
4/16/10	936		X	PV-S27-B-MS	1	X	
4/16/10	936		X	PV-S27-B-MSD	1	X	
4/16/10	950		X	PV-S33-A	1	X	
4/16/10	951		X	PV-S33-B	1	X	
4/16/10	957		X	PV-R21-A	1	X	
4/16/10	1000		X	PV-S34-A	1	X	
4/16/10	1009		X	PV-S6-A	1	X	
4/16/10	1015		X	PV-S3-A	1	X	
4/16/10	1020		X	PV-S36-A	1	X	

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Todd Ward	4/16/10 1430	Todd Ward	4/16/10 1700
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**

Client:	Project Manager:	Parameters/Method Numbers for Analysis	Chain of Custody Record
EA Engineering Science, and Technology, Inc.	**Peggy Derrick**		Laboratory:
	Phone: **410-329-5126**		**USEPA**
15 Loveton Circle	Field Contact:		**Region 2 Laboratory**
Sparks, MD 21152	**Todd Ward**		**2890 Woodbridge Ave.**
	Phone: **410-746-1250**		**Edison, NJ 08837**
Project Name: **Vineland Phase V sediment sampling**			**Phone: 732-906-6886**
Project#: 62305.01			**ATTN: Mr. John Birri/John Bourbon**
Page 5 of 7			

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Arsenic EPA 200.7/6010B	Remarks
			X	PV-DUP7	1	X	
4/16/10	1020		X	PV-S36-A-MS	1	X	**Note: 28 day TAT required**
4/16/10	1020		X	PV-S36-A-MSD	1	X	
4/16/10	1100		X	PV-S17-A	1	X	
4/16/10	1101		X	PV-S17-B	1	X	
4/16/10	1113		X	PV-S19-A	1	X	
4/16/10	1117		X	PV-R9-A	1	X	
4/16/10	1123		X	PV-R13-A	1	X	
4/16/10	1125		X	PV-R5-A	1	X	
4/16/10	1127		X	PV-R6-A	1	X	
4/16/10	1140		X	PV-R12-A	1	X	
4/16/10	1142		X	PV-S8-A	1	X	
4/16/10	1144		X	PV-R20-A	1	X	
4/16/10	1230		X	PV-R22-A	1	X	
			X	PV-DUP8	1	X	
4/16/10	1235		X	PV-R22-B	1	X	
4/16/10	1235		X	PV-R22-B-MS	1	X	
4/16/10	1235		X	PV-R22-B-MSD	1	X	

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Todd Ward	4/16/10 1430	Todd Ward	4/16/10 1700
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time

Client:	Project Manager:	Parameters/Method Numbers for Analysis	Chain of Custody Record
EA Engineering Science, and Technology, Inc.	**Peggy Derrick**		Laboratory:
	Phone: **410-329-5126**		**USEPA**
15 Loveton Circle	Field Contact:		**Region 2 Laboratory**
Sparks, MD 21152	**Todd Ward**		**2890 Woodbridge Ave.**
	Phone: **410-746-1250**		**Edison, NJ 08837**
Project Name: Vineland Phase V sediment sampling			**Phone: 732-906-6886**
Project#: 62305.01			**ATTN: Mr. John Birri/John Bourbon**
Page 6 of 7			

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Arsenic EPA 200.7/6010B	Remarks
4/16/10	1245		X	PV-R2-A	1	X	
4/16/10	1247		X	PV-R14-A	1	X	**Note: 28 day TAT required**
4/16/10	1249		X	PV-R17-A	1	X	
4/16/10	1300		X	PV-S1-A	1	X	
4/16/10	1302		X	PV-S10-A	1	X	
4/16/10	1304		X	PV-S12-A	1	X	
4/16/10	1310		X	PV-S2-A	1	X	
4/16/10	1312		X	PV-S2-B	1	X	
4/16/10	1315		X	PV-S9-A	1	X	
4/16/10	1317		X	PV-S9-B	1	X	
4/16/10	1325		X	PV-S5-A	1	X	
4/16/10	1327		X	PV-S5-B	1	X	
			X	PV-DUP9	1	X	
4/16/10	1335		X	PV-R10-A	1	X	
4/16/10	1337		X	PV-R10-B	1	X	
4/16/10	1337		X	PV-R10-B-MS	1	X	
4/16/10	1337		X	PV-R10-B-MSD	1	X	
4/16/10	1342		X	PV-S11-A	1	X	

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Todd Ward	4/16/10 1430	Todd Ward	4/16/10 1700
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Peggy Derrick**
	Phone: **410-329-5126**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Todd Ward**
	Phone: **410-746-1250**

Project Name: Vineland Phase V sediment sampling

Project#: 62305.01

Page 7 of 7

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Arsenic EPA 200.7/6010B														Remarks
4/16/10	1344		X	PV-S11-B	1	X														
4/16/10	1347		X	PV-R3-A	1	X														Note: 28 day TAT required
4/16/10	1349		X	PV-R3-B	1	X														
4/16/10	1355		X	PV-S14-A	1	X														
4/16/10	1357		X	PV-S14-B	1	X														
4/16/10	1400		X	PV-R11-A	1	X														
4/16/10	1400		X	PV-R11-A-MS	1	X														
4/16/10	1400		X	PV-R11-A-MSD	1	X														
4/16/10	1402		X	PV-R11-B	1	X														
			X	PV-DUP10	1	X														
4/16/10	1408		X	PV-S7-A	1	X														
4/16/10	1410		X	PV-S7-B	1	X														
4/16/10	1415		X	PV-S18-A	1	X														

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
USEPA
Region 2 Laboratory
2890 Woodbridge Ave.
Edison, NJ 08837

Phone: 732-906-6886

ATTN: Mr. John Birri/John Bourbon

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Todd Ward	4/16/10 1430	Todd Ward	4/16/10 1700
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time

Case Narrative:
Vineland Chemical #10040039

The National Environmental Laboratory Accreditation Conference (NELAC) is a voluntary environmental laboratory accreditation association of State and Federal agencies. NELAC established and promoted a national accreditation program that provides a uniform set of standards for the generation of environmental data that are of known and defensible quality. The EPA Region 2 Laboratory is NELAC accredited. The Laboratory tests that are accredited have met all the requirements established under the NELAC Standards.

Comment(s):

- The contaminant concentrations for all sediment/soil samples are reported on a "dry-weight" basis.

- All field samples designated with a "MS" or "MSD" were treated as environmental samples and reported as such. A separate matrix spike sample is prepared, analyzed and evaluated for each batch of 20 samples; however, the results for this sample, and other QC samples associated with each batch, are not included in the Laboratory report.

Data Qualifier(s):

U- The analyte was not detected at or above the Reporting Limit.
J- The identification of the analyte is acceptable; the reported value is an estimate.
K- The identification of the analyte is acceptable; the reported value may be biased high.
L- The identification of the analyte is acceptable; the reported value may be biased low.
NJ-There is presumptive evidence that the analyte is present; the analyte is reported as a tentative identification. The reported value is an estimate.

Reporting Limit(s):

The Laboratory was able to achieve the appropriate Reporting Limit for Arsenic as requested.

Method(s):

All methods that are NELAC accredited in the Laboratory are noted with "NELAC" at the end of the method reference.

- TAL Metals Analysis (As), EPA SOP C-109 (ICP/AES Method)

Approval: _____ Date: 5/21/10

U.S. Environmental Protection Agency
Region 2 Laboratory
2890 Woodbridge Avenue
Edison, NJ 08837

Data Report: VINELAND CHEMICAL

Project Number: 10040039

Program: Y206E

Project Leader: ERIKA MCCORMICK

Remark Codes	Explanation
U	THE ANALYTE WAS NOT DETECTED AT OR ABOVE THE REPORTING LIMIT.
J	THE IDENTIFICATION OF THE ANALYTE IS ACCEPTABLE; THE REPORTED VALUE IS AN ESTIMATE.
UJ	THE ANALYTE WAS NOT DETECTED AT OR ABOVE THE REPORTING LIMIT. THE REPORTING LIMIT IS AN ESTIMATE.
N	THERE IS PRESUMPTIVE EVIDENCE THAT THE ANALYTE IS PRESENT; THE ANALYTE IS REPORTED AS A TENTATIVE IDENTIFICATION.
NJ	THERE IS PRESUMPTIVE EVIDENCE THAT THE ANALYTE IS PRESENT; THE ANALYTE IS REPORTED AS A TENTATIVE IDENTIFICATION. THE REPORTED VALUE IS AN ESTIMATE.
R	THE PRESENCE OR ABSENCE OF THE ANALYTE CANNOT BE DETERMINED FROM THE DATA DUE TO SEVERE QUALITY CONTROL PROBLEMS. THE DATA ARE REJECTED AND CONSIDERED UNUSABLE.
K	THE IDENTIFICATION OF THE ANALYTE IS ACCEPTABLE; THE REPORTED VALUE MAY BE BIASED HIGH. THE ACTUAL VALUE IS EXPECTED TO BE LESS THAN THE REPORTED VALUE.
L	THE IDENTIFICATION OF THE ANALYTE IS ACCEPTABLE; THE REPORTED VALUE MAY BE BIASED LOW. THE ACTUAL VALUE IS EXPECTED TO BE GREATER THAN THE REPORTED VALUE.
NV	NOT VALIDATED
INC	RESULT NOT ENTERED

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01254 Field/Station ID: PV-S29-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	21		mg/Kg

AM01255 Field/Station ID: PV-DUP1
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	14		mg/Kg

AM01256 Field/Station ID: PV-S26-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	340		mg/Kg

AM01257 Field/Station ID: PV-S26-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	61		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01258 Field/Station ID: PV-S32-A Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	16		mg/Kg

AM01259 Field/Station ID: PV-S39-A Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	24		mg/Kg

AM01260 Field/Station ID: PV-S39-B Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	6.4		mg/Kg

AM01261 Field/Station ID: PV-S25-A Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	29		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01262 Field/Station ID: PV-S25-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	5.5		mg/Kg

AM01263 Field/Station ID: PV-S40-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	30		mg/Kg

AM01264 Field/Station ID: PV-S40-A-MS Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	51		mg/Kg

AM01265 Field/Station ID: PV-S40-A-MSD Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	26		mg/Kg

AM01266 Field/Station ID: PV-S40-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	4.2		mg/Kg

AM01267 Field/Station ID: PV-DUP2
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	4.9		mg/Kg

AM01268 Field/Station ID: PV-S38-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	9.4		mg/Kg

AM01269 Field/Station ID: PV-S30-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	20		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01270 Field/Station ID: PV-S31-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	40		mg/Kg

AM01271 Field/Station ID: PV-S24-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	320		mg/Kg

AM01272 Field/Station ID: PV-S41-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	5.4		mg/Kg

AM01273 Field/Station ID: PV-S37-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	3.6		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01274 Field/Station ID: PV-DUP3 Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	4.2		mg/Kg

AM01275 Field/Station ID: PV-S42-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	8.3		mg/Kg

AM01276 Field/Station ID: PV-S28-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	21		mg/Kg

AM01277 Field/Station ID: PV-S28-A-MS Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	25		mg/Kg

AM01278 Field/Station ID: PV-S28-A-MSD
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	20		mg/Kg

AM01279 Field/Station ID: PV-S28-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	[illegible]	0.77U	mg/Kg

AM01280 Field/Station ID: PV-S35-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.6		mg/Kg

AM01281 Field/Station ID: PV-R18-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	[illegible]	2.9U	mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01282 Field/Station ID: PV-R18-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	1.5U	mg/Kg

AM01283 Field/Station ID: PV-R23-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.75U	mg/Kg

AM01284 Field/Station ID: PV-R23-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.81U	mg/Kg

AM01285 Field/Station ID: PV-S43-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.87U	mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01286 Field/Station ID: PV-R1-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.85U	mg/Kg

AM01287 Field/Station ID: PV-S23-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	38		mg/Kg

AM01288 Field/Station ID: PV-S23-B
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	10		mg/Kg

AM01289 Field/Station ID: PV-S16-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	60		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01290 Field/Station ID: PV-R19-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	64		mg/Kg

AM01291 Field/Station ID: PV-R19-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	23		mg/Kg

AM01292 Field/Station ID: PV-S20-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	29		mg/Kg

AM01293 Field/Station ID: PV-DUP4
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	21		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01294 Field/Station ID: PV-S20-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	4.6		mg/Kg

AM01295 Field/Station ID: PV-S20-B-MS Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	5.3		mg/Kg

AM01296 Field/Station ID: PV-S20-B-MSD Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	4.7		mg/Kg

AM01297 Field/Station ID: PV-S13-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	820		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01298 Field/Station ID: PV-S13-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	230		mg/Kg

AM01299 Field/Station ID: PV-S15-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	230		mg/Kg

AM01300 Field/Station ID: PV-S15-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	240		mg/Kg

AM01301 Field/Station ID: PV-R7-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	0.91		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01302 Field/Station ID: PV-R15-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	6.5		mg/Kg

AM01303 Field/Station ID: PV-R8-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.6		mg/Kg

AM01304 Field/Station ID: PV-R16-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.1		mg/Kg

AM01305 Field/Station ID: PV-R16-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.5		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01306 Field/Station ID: PV-S21-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	18		mg/Kg

AM01307 Field/Station ID: PV-S21-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.3		mg/Kg

AM01308 Field/Station ID: PV-S4-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.4		mg/Kg

AM01309 Field/Station ID: PV-S4-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.1	U	mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01310 Field/Station ID: PV-DUP5 Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.97U	mg/Kg

AM01311 Field/Station ID: PV-R4-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.68U	mg/Kg

AM01312 Field/Station ID: PV-S22-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	270		mg/Kg

AM01313 Field/Station ID: PV-S22-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	400		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01314 Field/Station ID: PV-S27-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	110		mg/Kg

AM01315 Field/Station ID: PV-DUP6
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	98		mg/Kg

AM01316 Field/Station ID: PV-S27-B
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	7.0		mg/Kg

AM01317 Field/Station ID: PV-S27-B-MS
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	77		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01318 Field/Station ID: PV-S27-B-MSD Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	8.1		mg/Kg

AM01319 Field/Station ID: PV-S33-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	34		mg/Kg

AM01320 Field/Station ID: PV-S33-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.90U	mg/Kg

AM01321 Field/Station ID: PV-R21-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	3.1		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01322 Field/Station ID: PV-S34-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	63		mg/Kg

AM01323 Field/Station ID: PV-S6-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	410		mg/Kg

AM01324 Field/Station ID: PV-S3-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	6.2		mg/Kg

AM01325 Field/Station ID: PV-S36-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	0.77U		mg/Kg

AM01326 Field/Station ID: PV-DUP7 Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.1		mg/Kg

AM01327 Field/Station ID: PV-S36-A-MS Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.2		mg/Kg

AM01328 Field/Station ID: PV-S36-A-MSD Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.79U	mg/Kg

AM01329 Field/Station ID: PV-S17-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	13		mg/Kg

AM01330 Field/Station ID: PV-S17-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	3.2		mg/Kg

AM01331 Field/Station ID: PV-S19-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	230		mg/Kg

AM01332 Field/Station ID: PV-R9-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.5		mg/Kg

AM01333 Field/Station ID: PV-R13-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	0.96		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01334 Field/Station ID: PV-R5-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	0.92		mg/Kg

AM01335 Field/Station ID: PV-R6-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.0		mg/Kg

AM01336 Field/Station ID: PV-R12-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.0		mg/Kg

AM01337 Field/Station ID: PV-S8-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	5.0		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01338 Field/Station ID: PV-R20-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	500		mg/Kg

AM01339 Field/Station ID: PV-R22-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	1.5U	mg/Kg

AM01340 Field/Station ID: PV-DUP8 Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	1.5U	mg/Kg

AM01341 Field/Station ID: PV-R22-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.77U	mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01342 Field/Station ID: PV-R22-B-MS
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.77U	mg/Kg

AM01343 Field/Station ID: PV-R22-B-MSD
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.74U	mg/Kg

AM01344 Field/Station ID: PV-R2-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.94U	mg/Kg

AM01345 Field/Station ID: PV-R14-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.3		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01346 Field/Station ID: PV-R17-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	19		mg/Kg

AM01347 Field/Station ID: PV-S1-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	68		mg/Kg

AM01348 Field/Station ID: PV-S10-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	12		mg/Kg

AM01349 Field/Station ID: PV-S12-A
Matrix: Sediment
Sample Description:

Date Received: 4/19/2010

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	320		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01350 Field/Station ID: PV-S2-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	1.1U	mg/Kg

AM01351 Field/Station ID: PV-S2-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.93U	mg/Kg

AM01352 Field/Station ID: PV-S9-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	2.1U	mg/Kg

AM01353 Field/Station ID: PV-S9-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.82U	mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01354 Field/Station ID: PV-S5-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	3.3		mg/Kg

AM01355 Field/Station ID: PV-S5-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.92U	mg/Kg

AM01356 Field/Station ID: PV-DUP9 Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.95U	mg/Kg

AM01357 Field/Station ID: PV-R10-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.4		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01358 Field/Station ID: PV-R10-B Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.3		mg/Kg

AM01359 Field/Station ID: PV-R10-B-MS Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.5		mg/Kg

AM01360 Field/Station ID: PV-R10-B-MSD Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.0		mg/Kg

AM01361 Field/Station ID: PV-S11-A Date Received: 4/19/2010
Matrix: Sediment

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	6.3		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01362 Field/Station ID: PV-S11-B Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.99U	mg/Kg

AM01363 Field/Station ID: PV-R3-A Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	8.8		mg/Kg

AM01364 Field/Station ID: PV-R3-B Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	28		mg/Kg

AM01365 Field/Station ID: PV-S14-A Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.9		mg/Kg

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01366 Field/Station ID: PV-S14-B Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	---	0.71U	mg/Kg

AM01367 Field/Station ID: PV-R11-A Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.3		mg/Kg

AM01368 Field/Station ID: PV-R11-A-MS Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.2		mg/Kg

AM01369 Field/Station ID: PV-R11-A-MSD Date Received: 4/19/2010
Matrix: Sediment
Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.4		mg/Kg

AM01370 Field/Station ID: PV-R11-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.7		mg/Kg

AM01371 Field/Station ID: PV-DUP10
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	1.8		mg/Kg

AM01372 Field/Station ID: PV-S7-A
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	27		mg/Kg

AM01373 Field/Station ID: PV-S7-B
Matrix: Sediment
Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	2.6		mg/Kg

U.S. EPA Region 2 Laboratory
Data Report

Survey Name: VINELAND CHEMICAL

Project Number: 10040039

*Sorted By Sample ID

AM01374 Field/Station ID: PV-S18-A
Matrix: Sediment

Date Received: 4/19/2010

Sample Description:

Single Component Analyses

CAS Number	Analyte Name	Result	Remark Codes	Units
7440-38-2	ARSENIC	42		mg/Kg

Project Approval: _____ **Date:** 5/21/10

Refer to Page 1 for an explanation of Remark Codes

APPENDIX B

USEPA REGION 2 DESA - STANDARD OPERATING PROCEDURES C-109 AND C-116

EPA

STANDARD OPERATING PROCEDURE

DETERMINATION OF METALS IN AQUEOUS, TCLP EXTRACTS, SOIL/SEDIMENT, SLUDGE, WASTE OIL/ORGANIC SOLVENTS, AND BIOLOGICAL TISSUE SAMPLES BY TRACE (AXIAL CONFIGURATION) INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY

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Reviewed by: _____ _____
Signature — Date

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2
DIVISION OF ENVIRONMENTAL SCIENCE AND ASSESSMENT
LABORATORY BRANCH

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DETERMINATION OF METALS IN AQUEOUS, TCLP EXTRACT, SOIL/SEDIMENT, SLUDGE, WASTE OIL/ORGANIC SOLVENTS, AND BIOLOGICAL TISSUE MATRICES BY TRACE (AXIAL CONFIGURATION) INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY

1. Scope and Application

1.1 This SOP is applicable to the preparation of environmental samples, including aqueous, TCLP extract, soil/sediment, biological tissue, and waste oil/organic solvents, for the determination of the following metals:

Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cu, Cr, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Se, Sb, Si, Sn, Sr, Ti, Tl, V, and Zn

Note - This SOP is not applicable to the preparation and analysis of drinking water compliance monitoring samples. The procedure for the preparation and analysis of drinking water compliance monitoring samples using the Trace ICAP is detailed in Laboratory SOP DW-5.

1.2 All analysts must satisfactorily perform an initial demonstration of capability (DOC) by meeting the method performance criteria in Sec. 13.1 prior to performing sample analysis using this SOP.

1.3 The standard reporting limits for both aqueous and non-aqueous samples are listed in Table 2.

1.4 This SOP is based on EPA Method 200.7, Revision 4.4.

2. Summary of SOP

2.1 Environmental samples, e.g., aqueous, TCLP extracts, soil/sediment, sludges, waste oil/organic solvent, and biological tissue, are digested in a mixture of acids, according to the procedures described in U. S. Environmental Protection Agency, Region 2, SOP C-116 *"Preparation of Aqueous, TCLP Extracts, Soil/Sediment/Sludge, Waste Oil/Organic Solvents, and Biological Tissue Matrices by Block Digestion."*

2.2 The analysis described in this method involves multi-element determinations by ICAP-AES using a simultaneous Thermo-Jarrell Ash Trace Purge ICAP. The instrument measures characteristic atomic-line emission spectra by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element specific emission spectra are produced be a radio-frequency inductively coupled argon plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the line spectra are monitored at specific wavelengths by a photomultplier tube (PMT). Photocurrents from the pmt are processed and controlled by a computer system. A background correction technique is required to compensate for background contribution to the determination of the analytes. Background must be measured adjacent to the analyte wavelength during analysis. Various interferences must be considered and addressed appropriately.

3. Definitions

See **SOP G-15** for definitions.

4. Interferences

4.1 Several types of interference effects may contribute to inaccuracies in the determination of trace elements. They can be summarized as follows:

4.1.1 Spectral Interferences - these interferences can be categorized as 1) overlap of a spectral line from another element; 2) unresolved overlap of molecular band spectra; 3) background contribution from continuous or recombination phenomena; and 4) background contribution from stray light from the line emission of high concentration elements. The first of these effects can be compensated for by utilizing a computer correction of the raw data, requiring the monitoring and measurement of the interfering element. The second effect may require selection of an alternate wavelength. The third and fourth effects can usually be compensated for by a background correction adjacent to the analyte line. In addition, users of simultaneous multi element instrumentation must assume the responsibility of verifying the absence of spectral interference from an element that could occur in a sample but for which there is no channel in the instrument array. For this purpose, linear relations between concentration and intensity for the analytes and the interferences must be demonstrated over the range of interest.

4.1.2 Physical Interferences - these interferences are generally considered to be effects associated with the sample nebulization and transport processes. Such properties

as change in viscosity and surface tension can cause significant inaccuracies especially in samples which may contain high dissolved solids and/or acid concentrations. The use of a peristaltic pump may lessen these interferences. If these types of interferences are operative, they must be reduced by dilution of the sample. Another problem which can occur from high dissolved solids is salt buildup at the tip of the nebulizer. This affects aerosol flow-rate causing instrumental drift. Wetting the argon prior to nebulization, the use of a tip washer, or sample dilution have been used to control this problem. This problem can also be alleviated by using a Bergener nebulizer instead of a Meinhardt nebulizer. Also, it has been reported that better control of the argon flow rate improves instrument performance. This is accomplished with the use of mass flow controllers.

4.1.3 Chemical Interferences - these interferences are characterized by molecular compound formation, ionization effects and solute vaporization effects. Normally these effects are not pronounced with the ICP technique, however, if observed they can be minimized by careful selection of operating conditions (that is, incident power, observation position, and so forth), buffering of the sample and matrix matching. These types of interferecnes can be highly dependent on matrix type and specific analyte element.

4.2 Generally, whenever a new or unusual sample matrix is encountered, a series of tests on the matrix-type are performed, e.g., background check of the sample, sample overlay with standards, etc., prior to analyzing samples associated with that matrix. If the problems associated with the new matrix cannot be overcome, the sample must either be diluted appropriately (and the Reporting Limit raised accordingly) or analyzed by an acceptable different method.

5. Safety

The toxicity and carcinogenicity of each reagent used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be minimized by good laboratory practices. Normally accepted laboratory safety practices should be followed during reagent preparation and instrument operation. Always wear safety glasses or full-face shield for eye protection when working with these reagents. Each laboratory is responsible for maintaining a current safety plan, a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this SOP.

6. Apparatus and Materials

6.1. Inductively coupled argon plasma:

6.1.1 Thermo Jarrell Ash (TJA) ICAP 61E Trace Purge Analyzer (with an axial torch) controlled by a computer.
6.1.2 TJA radio-frequency generator.
6.1.3 High purity (99.99%) liquid argon.
6.1.4 A variable speed peristaltic pump which is used to deliver both standards and samples to the nebulizer.
6.1.5 Computer controlled mass flow controllers which regulate the argon flow rates.

6.2. A balance which has the capability to measure 0.1mg.

6.3. Labware (See Section 6.10 of EPA Method 200.7 Rev. 4.4).

7. Reagents and Solutions

7.1 Reagents - All reagents must be of high purity and suitable for trace metals analysis.

7.1.1 Hydrochloric acid, concentrated - HCl (GFS HCl, 37% Reagent ACS or equivalent)
7.1.2 Nitric acid, concentrated - HNO_3 (GFS HNO_3, Redistilled or equivalent)
7.1.3 Reagent grade water – ASTM Type I Water

7.2 Solutions - Refer to Table 1 for standard solutions preparation summary.

7.2.1 Calibration Stock Standard Solutions - Claritas Custom Standards manufactured by Spex CertiPrep under UL ISO 9001 Quality Assurance Program.

7.2.1.1 Calibration Standard 1 - SPEX CertiPrep Custom Claritas Standard (250 ppm of Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sb, Sn, Sr, Ti, Tl, V, and Zn) or equivalent.
7.2.1.2 Calibration Standard 2 - SPEX CertiPrep Custom Claritas Standard (250 ppm of Al, Ca, Fe, Mg, K, Na and Si) or equivalent.

7.2.2 Working Calibration Solution – The Working Calibration Solution is prepared from the Stock Calibration Standard Solutions (7.2.1) to a final concentration of 1,000 ug/L for all elements except for Al, Ca, Fe, K, Mg, Na and Si which are 10,000 ug/L. The solution is in 2% HNO_3 and 5% HCl.

7.2.3 Blanks – Four types of blanks are required for the analysis. The (1) calibration blank is used in establishing the analytical curve, the (2) initial calibration blank/continuing calibration blank (ICB/CCB) run after the calibration check standards to assess carryover, (3) a rinse blank is used to flush the instrument uptake system and nebulizer between standards, check solutions, and samples to reduce memory interferences and (4) a Laboratory Reagent Blank/Prep Blank (LRB/PB) is used to assess possible contamination from the sample preparation procedure and to assess spectral background.

7.2.3.1 The calibration blank is prepared by adding HNO_3 and HCl to reagent grade water to the same concentrations used for the calibration standard solution.

7.2.3.2 The rinse blank is prepared by acidifying reagent grade water to the same concentration of the acids as used in the calibration blank.

7.2.3.3 The ICB and CCB are prepared by acidifying reagent grade water to the same concentration of acids as used in the calibration blank

7.2.3.4 Laboratory reagent blank (LRB)/Prep blank (PB) - must contain all the reagents in the same volumes as used in digesting the samples. The LRB/PB must be carried through the same preparation scheme as the samples including digestion, if applicable.

7.2.4 Initial Calibration Verification/Continuing Calibration Verification Solution (ICV/CCV) – These verification standard solutions are used to initially and periodically verify instrument performance during analysis. The ICV/CCV stocks must be obtained from a source different from the calibration stock standard solutions and prepared in the same acid mixture as the calibration standards. The concentration of the analytes in the ICV/CCV solution is 200 ug/L for all elements except Al, Ca, Fe, K, Mg, Na and Si which is 5,000 ug/L.

7.2.4.1 Claritas Custom Standard - ICV1, 250ppm (Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sb, Sn, Sr, Ti, Tl, V, and Zn)

7.2.4.2 Claritas Custom Standard - ICV2, 250ppm (Al, Ca, Fe, K, Mg, Na, Si)

7.2.5 Low Level Check (ICV/50, ICV/20 and ICV/10) – The low level checks are used to initially and periodically verify instrument performance at lower concentration levels. The concentration of the analytes should be at or above the analyte reporting limit. Al, Ca, Fe, K, Mg, and Na are not evaluated in these low level check standards. The instrument performance low level checks are at 2%, 5% and 10% dilution of the ICV. The concentration of analytes of concern in ICV/50 are 4 ug/L for ICV1 elements and 100 ug/L for ICV2 elements; ICV/20 are 10 ug/L for the ICV1 elements and 250ug/L for ICV2 elements. The concentration

of the analytes of concern in the ICV/10 are 20 ug/L for ICV1 and 500 ug/L for ICV2.

7.2.6 Internal Standard Solution (5ppm Y; Li 400ppm) – The normal calibration procedure for arc/spark involve the use of an internal standard. An element not found in the matrix being analyzed is added to each standard and each sample. Should the volume of aspirated sample change a corresponding intensity change will occur for all elements. Since the ratio remains constant, the possible error is eliminated.

7.2.7 Profiling Solution (5ppm As) – External problems like temperature and humidity changes can cause short and long term drift. This drift is due to the expansion or contraction of the focal curve with the result that the analytical line moves in relation to the measuring device. Periodic profiling corrects for this drift.

7.2.8 Inter-Element Correction (IEC) Solution (previously known as Interferents Only Solution IOS) - When inter-element corrections are applied, a spectral interference check solution is needed containing concentrations of the interfering elements at levels that will provide an adequate test of the correction factors.

8. Sample Collection, Preservation, Storage and Holding Time

8.1 Sample Collection - Samples must be collected in plastic or glass containers.

8.2 Preservation and Storage

8.2.1 Aqueous samples - the samples are preserved using concentrated HNO_3. The preservation is performed either a) in the field at the time of collection, or b) in the Laboratory upon receipt (within one business day). If the samples are preserved in the Laboratory, the samples must be held for sixteen hours after acidification and then verified to a pH<2 prior to sample processing. If the sample pH is verified to be pH>2 after the sixteen hours, additional HNO_3 must be added and the sample held for an additional sixteen hours until verified to a pH<2. The samples are stored at room temperature.

8.2.2 Soil/Sediment/Sludge samples - these samples are preserved in a refrigerator at ≤4°C. Alternatively, the samples maybe stored at ≤-20°C in a freezer.

8.2.3 Biological Tissue samples - The samples are stored at ≤-20°C in a freezer.

8.2.4 Waste Oil/Organic Solvents - these samples do not require any preservation. The

samples are stored at room temperature.

8.2.5 Drum Samples - no temperature requirement for these samples.

8.3 Holding time

8.3.1 Aqueous samples must be prepared and analyzed within six months of collection.

8.3.2 Soil/Sediment/Sludge samples must be digested and analyzed within six months of collection.

Note: If soil/sediment samples are stored at ≤-20°C, the holding time is extended. The samples must be prepared within 12 months of collection and analyzed within 6 months of digestion.

8.3.3 Biological Tissue samples must be digested within 12 months of collection and analyzed within 6 months of digestion.

8.3.4 Waste Oil/Solvent samples - a holding time is not established for the digestion or analysis of these samples.

8..3.5 Drum Samples do not require any holding time.

9. Sample Preparation

All Environmental samples, e.g., aqueous, soil/sediment, waste oil/organic solvent, and biological tissue, including NPDES wastewater compliance monitoring samples, are digested in a mixture of acids using the procedures described in SOP Number C-116 "Digestion of Metals Aqueous, TCLP Extracts, Soil/Sediment, Sludge, Waste Oil/Organic Solvents, TCLP Extracts and Biological Tissue Matrices by DigiBloc".

10. Instrument Operating Conditions

Before using this method, the following procedure is followed to optimize plasma conditions. The analyst should follow Thermo Electron's instructions unless other conditions provide better performance.

10.1 Before lighting the plasma, make sure the following settings are in place:
Auxiliary gas- low
Nebulizer flow rate ~ 0.60L/min
Pump Rate ~ 140 rpm

Internal standard solution with a buffer
It is important to ensure that there is no pulsing in any of the lines.

10.2 After lighting the plasma, make sure the above settings have not changed and verify that the RF power setting is at 950 W.

10.3 Allow the plasma to become stable. At a minimum, wait 30 minutes before proceeding.

10.4 Optically profile the spectrometer by aspirating a 5ppm arsenic solution. The spectrum shifter must be between -0.05 and +0.05.

11. Sample Analysis

11.1 Configure the instrument settings to those in Section 10.

11.2 Fill in the sample ID file.

11.3 After the plasma has become stable, standardize the instrument using the mixed calibration standard solution (Section 7.2.2) and the calibration blank (Section 7.2.3.1). The average of three readings is to be used. Flush the system with the rinse blank for a minimum of 60 seconds between each standard.

11.4 After the completion of the initial requirements, samples should be analyzed in the same operational manner used in the standardization routine with a rinse blank also being used between all sample solutions, LFBs/LCSs-Aqueous, LFMs/MSs, and check solutions.

11.5 During the analysis of samples, the laboratory must comply with the required quality control in Sections 14. Only for the "direct analysis" of drinking water is the sample digestion step of the LRB/PB, LFB/LCS-Aqueous, and LFM/MS not required.

11.6 Sample analysis consists of the following:

Calibration Blank
Mixed Standard
IPC/ICV
IPB/ICB (Calibration Blank solution)
Low Check Sample/ICV/50, ICV/20 and ICV/10 (either solution at or below the analyte MCL excluding Al, Fe, Mg, and Na)
SIC/IOS

LRB/PB
LFBs/LCSs
Samples
LFM/MS
IPC/CCV -must be analyzed at a minimum of every 10 samples
IPB/CCB
ICV/50, ICV/20, ICV/10
SIC/IOS

Note : The IPC/CCV and IPB/CCB must be analyzed at a minimum of every 10 analyses and at the end of each analysis run.

11.7 Determined sample analyte concentrations that are 90% or more of the upper limit of the analyte LDR must be diluted with reagent grade water that has been acidified in the same manner as the calibration blank and reanalyzed. See Section 11.4.7. of EPA Method 200.7, Rev. 4.4.

11.8 Report Data as directed in Section 12.

12. Data Analysis and Calculations

12.1 Refer to Appendix A for detailed instructions for data workup and/or upload into LabWorks.

12.2 Aqueous Samples - Undigested

All dilution factors required as a result of dilutions made during analysis are applied at the instrument. Therefore, all of the aqueous sample results generated from the analysis (in ug/L) can be reported directly from the instrument. All results are reported to two significant figures and, in most cases, are reported using reporting limits listed in Table 2.

12.3 Aqueous Samples - Digested

Dilution factors required as a result of dilutions made during analysis are also applied at the instrument. Therefore, all of the aqueous sample results, in ug/L, generated from the analysis can be reported directly from the instrument. All results are reported to two significant figures and, in most cases, are reported down to the standard reporting limit listed in Table 2.

12.4 Non-Aqueous Samples

All dilution factors required as a result of dilutions made during analysis are applied at the instrument. Therefore, all of the results, in ug/L, generated from the analysis can be used directly from the instrument. These "ug/L" results must then be converted to "mg/Kg" results. The ug/L result is multiplied by the final digestate volume in Liters, usually 0 .050 L, and divided by the sample mass in grams, usually 0.50 g (the specific sample volume and mass are recorded in the metals sample preparation log book). For dry weight calculation, the mg/Kg results must be divided by the decimal version of the percent solids, e.g., 90% is 0.90. Refer to to SOP G-23 for Percent Dry Solids.

All mg/Kg results are reported to two significant figures and, in most cases, are reported using the reporting limits listed in Table 2, adjusted for percent solids correction for dry weight basis.

13. Method Performance

An initial demonstration of capability (DOC) must be performed each time there is a significant change in the chemistry of the method, a major modification to an existing instrument, or a new instrument is installed. A DOC is performed by each analyst designated to analyze samples using this method. An annual check must subsequently be performed and documented for each analyst using this method.

13.1 Accuracy and Precision

13.1.1 Initial Demonstration of Capability

An initial demonstration of capability study must be conducted for this method for each analyst using this method. The study consisted of the analysis of four standards which are from a source independent of the standard curve. The results of the standards must be within the acceptance criteria supplied by the manufacturer or within 10% if none are specified. The % RSD should be within 20%. The results of the accuracy and precision study (true value, % recovery, standard deviation and % RSD) are maintained by the Quality Assurance Officer for each analyst and are located in the Central Branch File.

13.1.2 Continuing Demonstration of Capability

An annual continuing demonstration of capability study must be performed and documented. It may consist of either successfully analyzing a PT sample or analyzing

2 sets of AQC standards to within control limits as stated in section 13.1.1. The results of the continuing accuracy and precision study (true value, % recovery, standard deviation and % RSD or final report from the PT provider) are maintained by the Quality Assurance Officer for each analyst and are located in the Central Branch File.

13.2 Method Detection Limit (MDL)

An MDL Study must be conducted for this method. The study is based on the requirements listed in 40 CFR Part 136 Appendix B. Specific procedures for conducting an MDL study can be found in SOP # G-8. The MDL Study comprised the analysis of seven reagent grade water samples fortified at a level between 2-3x the detection limit. The results of the MDL determination (true value, average concentration, standard deviation and calculated MDL) are maintained by the Quality Assurance Officer for each method and are located in the Central Branch File.

13.3 Linear Dynamic Range (LDR)

The LDR must be determined by generating a normal linear calibration curve followed by the analysis of successively higher standard solutions. The results of these standard solutions are used to calculate % recovery. This is conducted until the % recovery fell below 90%. The last standard that had a % recovery of at least 90%is identified as the LDR limit.

The results of the LDR Study are maintained in a file next to the instrument. The LDR results must be below or equal to that listed as the upper range in EPA Method 200.7.

14. Quality Control

14.1 Calibration Curve

Acceptance Criteria - A calibration blank and one mixed standard are used to standardize the instrument. After standardization, the ICV and ICB are used to determine acceptance.

Corrective Action - If the results of the ICV or ICB are unacceptable, analysis must be discontinued, the cause determined and/or in the case of drift the instrument re-calibrated.

14.2 Initial Calibration Verification (ICV).

Acceptance Criteria - Analyze the ICV solution from a separate identifiable source (different lot number or vendor from that of calibration standards) immediately following

the calibration. The result of the ICV solution must be within ±5% of the true value for NPDES compliance monitoring samples and ±10% for all other samples.

Corrective Action - If the calibration cannot be verified within the specified limits, re-analyze the ICV solution. If the results of the second analysis of the IPC/ICV solution is not within the acceptance limits for both types of samples (NPDES compliance monitoring samples and other samples), the analysis must be evaluated and the cause determined and the instrument re-calibrated. If the results of the second analysis of the IPC/ICV solution is not within the acceptance limits of NPDES requirements but within the acceptance limits for other program samples, a case narrative must be issued for samples that are non-compliant.

14.3 Continuing Calibration Verification (CCV)

Acceptance Criteria - Analyze the CCV solution, from the same source as that used for the ICV, after a maximum of ten samples and at the end of the sample run. The results of each CCV solution must be within ±10% of the true value for NPDES compliance monitoring samples (±20% for all other samples).

Corrective Action - If the calibration cannot be verified within the specified limits, re-analyze the CCV solution. If the results of the second analysis of the CCV solution is not within the acceptance limits, the analysis must be discontinued, the cause determined and the instrument re-calibrated. All samples following the last acceptable CCV solution must be reanalyzed.

14.4 Initial Calibration Blank/Continuing Calibration Blank (ICB/CCB)

Acceptance Criteria - Analyze the calibration blank immediately following each calibration and after every CCV. All ICB/CCBs results must be < the |Reporting Limit|.

Corrective Action - If the result of the ICB/CCB is > |Reporting Limit|, the analysis should be stopped the problem identified, and the ICB/CCB reanalyzed. If the ICB/CCB results remain > |Reporting Limit|, the instrument must be recalibrated .

14.5 Preparatory Blank (PB)/Laboratory Reagent Blank(LRB)

Acceptance Criteria - Analyze an LRB/PB per 20 samples or less per matrix. The PB/LRB results must be < the |Reporting Limit|.

Corrective Action - If the result of the PB/LRB is > |Reporting Limit|, then all associated samples with a concentration of ≤ 10x the amount found in the PB/LRB should be

reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be either: qualified accordingly, or the Reporting Limit is raised to the amount found in the sample. Check with the team leader/section chief to determine which option should be used.

Sample results ≥ 10x the amount found in the PB/LRB are not considered to be affected by the blank contamination or drift, so no corrective action is needed.

14.6 Laboratory Fortified Blank (LFB)/Laboratory Control Samples (LCS)

14.6.1 Aqueous LCS

Acceptance Criteria - Analyze two aqueous LFB/LCS samples with each batch of aqueous samples of 20 or less. Calculate accuracy as percent recovery using the following equation:

$$\% \text{ Recovery} = \frac{\text{Average of 2 LFB/LCS's}}{s} \times 100$$

where: LFB/LCS = laboratory fortified blank/laboratory control sample
s = concentration of analytes added to fortify the LFB/LCS solution

The % recovery of the aqueous LFB/LCS must be within ±15% of the true value for NPDES wastewater compliance monitoring samples and within ±20% of the true value for all other environmental samples. The RPD of two LCSs should be <20%.

14.6.2 Solid LCS

Acceptance Criteria - Analyze two solid LCS samples with each batch of solid samples of 20 or less. Calculate accuracy as percent recovery using the following equation:

$$\% \text{ Recovery} = \frac{\text{Average of 2 LCS's, mg/Kg}}{\text{True Value, mg/Kg}} \times 100$$

The % recovery of the solid LCS must be within ±25% of the true value or within the limits established by the vendor. The relative percent difference (RPD) of the duplicates should not exceed 25% for solid samples.

Corrective Action for 14.6.1 and 14.6.2 - If the % recovery or %RPD results are outside the required control limits, the affected samples should be reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be qualified accordingly.

14.7 Laboratory Fortified Matrix (LFM)/Matrix Spike(MS) Recovery

Acceptance Criteria - Fortify a known amount of analytes to one sample per matrix per project per batch of 20. The LFM/MS aliquot must be a duplicate of the aliquot used for sample analysis. When possible, the concentration should be the same as that added to the aqueous LFB/LCS, but should not exceed the midpoint concentration of the calibration curve. Calculate the percent recovery, corrected for background concentration measured in the unfortified sample aliquot, and compare these values to the control limits to the designated matrices recovery ranges : ±20% for aqueous samples; ±25% for solid samples (soils, sediment, and NAPL); and ±50% for sludge and biological tissue samples. Percent recovery is calculated using the following equation:

$$R = \frac{C_s - C}{s} \times 100$$

where:
R = percent recovery,
Cs = fortified sample concentration,
C = sample background concentration, and
s = conc. equivalent of metal added to sample.

Corrective Action - If % recovery of the MS is outside the required control limits, and the laboratory performance is shown to be in control, the recovery problem encountered is judged to be matrix related, not system related. The native sample result of the sample used to produce the MS must be qualified accordingly.

Note: The % recovery of the MS is not evaluated if the result of the unfortified sample concentration is ≥1.0x the level used to fortify the sample.

14.8 Serial Dilution Test

Acceptance Criteria - Analyze a 20% dilution of the MS sample(s). The serial diluted sample result(s), adjusted for the dilution, should agree with the MS result(s) to within 20% RPD.

Corrective Action - If the % RPD is outside the required control limits, and the

laboratory performance is shown to be in control, the precision problem encountered is judged to be matrix related, not system related, and the sample should be qualified accordingly.

14.9 Low-Level Checks - (ICV/50, ICV/20 and ICV/10)

Acceptance Criteria - Analyze the ICV/50, ICV/20 and ICV/10 standards, from a separate identifiable source other than the calibration standards, immediately following the ICV and ICB. The ICV/50, ICV/20 and ICV/10 should also be analyzed after every CCV. The % recovery of the ICV/50, ICV//20 and ICV/10 must be within ±30% of the true value for all analytes of interest.

Corrective Action - If the ICV/50, ICV/20 and ICV/10 cannot be verified within the specified limits, analysis must be evaluated, the cause determined and/or in the case of drift the instrument re-calibrated. If the ICV/50 and ICV/20 are not within the specified limits for the elements of interest but the ICV/10 is within the required limits, then the Reporting Limit is raised up to the ICV/10 level as long as the sample project requirement allows.

14.10 Spectral Interference Check (SIC)/Inter-Element Correction (IEC) Solution (formerly known as Interferents Only Solution - IOS)

Acceptance Criteria - All metal results (required by the project(s), except for Al, Fe, Ca, K, Mg, and Na, should be below the established Reporting Limits listed in Table 2

Corrective Action - If a required metal result is > the |Reporting Limit|, the individual interferent metals must be analyzed independently to assess which metal is causing the interference. Once identified, the appropriate inter-element correction factor(s) and background correction point(s) must be reviewed, and where appropriate, adjusted. After the adjustment is completed, the IEC standard must be re-analyzed. Once a successful IEC is analyzed, the analysis can commence.

A corrective action is not required if one of the following conditions are met:

1. If the metal that is "affected" by the interferent is not required for the project(s) in question;
2. If the concentration of the metal that is "affected" by the interferent is < the |Reporting Limit|;
3. If the concentration of the metal causing the interference in the "affected" environmental sample(s) is at a trace level, i.e., <10000 ug/L (the level used in our mixed calibration standard, section 7.2.1).

14.11 Triplicate Integrations

Acceptance Criteria - Each analysis consists of three separate integrations or readings. This includes the calibration standards, quality control samples and all associated environmental samples. The average of the three measurements is used for reporting results. The RSD must be ≤20% for all results that are ≥ the reporting limit.

Corrective Action - If the RSD for a calibration standard, quality control sample and environmental sample is outside the control limits, the analysis must be repeated. If the RSD is still outside the control limits, the analysis must be terminated, and repeated after correcting the problem. If the RSD is still outside the control limits, and the laboratory performance, i. e. CCV, is shown to be in control, the RSD problem encountered is judged to be matrix related, not system related, and the sample should be qualified accordingly.

15. Reporting and Validation

15.1 Reporting Limits - The reporting limits are calculated based on the concentration of the lowest calibration standard analyzed. The reporting limits are matrix and dilution dependent. All results are reported to 2 significant figures.

15.2 Sample Data Package

The sample data package should include but not be limited to the following:

- ICAP-AES QA/QC Checklist with all relevant information entered;
- Copies of Log Book entries of Analysis Run Log; Sample Digestion Log, and if required, Sample Percent Solids Log and/or pH Log;
- Calibration Report;
- Summary Analysis Form;
- QC Summary Forms; and
- Instrument generated Sample Data

15.3 Laboratory Information Management System (LIMS) - The analyst enters the data on the LIMS under the appropriate analytical codes.

15.4 Data Validation - The data package is given to the reviewer. The review is done by a peer who was not involved in the analysis. Upon completion of the review, including validation of all the appropriate codes in the LIMS for the particular project(s), the data reviewer will sign and date the QA/QC Checklist.

15.5 Data Records - All project records associated with the data package are filed under one designated project file. All other projects associated with the data package are

referenced to this designated project file via a "cross reference form". The "cross reference form" is placed in each of the project files that were associated with the data package.

The data package is placed in the bin identified for the designated project file. The records for this designated project file are filed in our locked record cabinets once all data from the project, e.g., non-metal inorganic data, organic data, microbiology data, etc. has been reviewed by the appropriate staff.

16. Pollution Prevention

16.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasiblely reduced at the source, the Agency recommends recycling as the next best option.

16.2 The quantity of chemicals purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

16.3 For information about pollution prevention that may be applicable to laboratories and research institutions, consult *Less is Better: Laboratory Chemical and Management for Waste Reduction,* available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington D.C. 20036, (202)872-4477.

17. Waste Management

The USEPA requires that laboratory waste management practices be conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process waste should be characterized and disposed of in an acceptable manner. The Agency urges laboratories to protect the air, water, and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any sewer discharge permits and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For

further information on waste management consult the Region 2 SOP G-6, "*Disposal of Samples and Hazardous Wastes*".

18. REFERENCES

- U. S. Environmental Protection Agency. "*Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry,*" Method 200.7, Revision 4.4, May 1994.
- U. S. Environmental Protection Agency, Region 2, SOP G-6 "*Disposal of Samples and Hazardous Wastes.*"
- U. S. Environmental Protection Agency, Region 2, SOP G-8 "*Laboratory Policy for the Determination of Method Detection Limits (MDLs).*"
- U. S. Environmental Protection Agency, Region 2, SOP G-15 "*Laboratory Definitions and Data Qualifiers.*"
- U. S. Environmental Protection Agency, Region 2, SOP G-23 "*Percent Dry Solids.*"
- U. S. Environmental Protection Agency, Region 2, SOP C-116 "*Preparation of Aqueous, TCLP Extracts, Soil/Sediment/Sludge, Waste Oil/Organic Solvents, and Biological Tissue Matrices by Block Digestion.*"
- Method 2340 B "*Hardness by Calculation*"_Standard Methods for the Examination of Water and Wastewater, 20th Edition-1998.
- U. S. Environmental Protection Agency, Solid Waste 846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Method 6010C "*Inductively Coupled Plasma - Atomic Emission Spectrometry*" Laboratory Manual, Revision 3, November 2000.

APPENDIX A
DATA WORKUP

- Copy data database (e.g., 121604.dbf) and the sample data file (samples.dbf) to a rewritable CD. The file nomenclature is based on the date of analysis, e.g., 121604.dbf - 12 is month of December, 16 is the date and 04 is the year 2004.
- Login to LABWORKS
- Select Results from the main menu
- Select Instrument Conversion
- Select file name by recalling the data file, e.g., 121604.dbf
- Click OK. After OK is clicked a file is created converting the samples to .grf files
- Upload the correct .grf file into each individual sample by selecting the sample number with the corresponding test codes in the project.
- Right click on the results cell
- Select Modify Results
- Select Load Results
- Select the correct file from L:\Labwork_ES\LWDATA5\INTRFACE\TJA_DBF drive
- Click OK
- Check results to ensure that they are correct
- Delete any test codes in the project LIMS codes that are not required
- Make sure the reporting limits reflect analytical and prep dilutions, if any.

Table 1. Standard Solutions Preparation:

Standard/Solution Name	Concentration Required
Std 1 - Calibration Blank/ ICB/Rinse Blank/CCB	Reagent grade water
Std 2	1000 ppb all elements except 10,000 ppb for Al, Ca, Fe, Mg, K, Na and Si
ICV/CCV	200 ppb for all elements except 5000 ppb Al, Ca, Fe, Mg, K, Na and Si
ICV/50	4 ppb all elements except 100 ppb for Al, Ca, Fe, Mg, K, Na and Si
ICV/20	10 ppb all elements except 250 ppb for Al, Ca, Fe, Mg, K, Na and Si
ICV/10	20 ppb all elements except 500 ppb for Al, Ca, Fe, Mg, K, Na and Si
IEC Solution (previously known as IOS)	300,000 ppb Al, Ca, Fe, Mg and 60,000 ppb Na
Profile Solution	5,000 ppb As
Internal Standard	2,000,000 ppb Li 10,000 ppb Y

Note : The diluent used in preparing all the above standard solutions must be reagent grade water with 2% HNO_3 and 5% HCl.

Table 2. Reporting Limits - Aqueous and Soil/Sediment

Element	MDL, ug/L	Reporting Limit, ug/L	Reporting Limit, mg/Kg
Ag	1.6	6	0.6
Al	48.5	200	200
As	2.3	8	0.8
B	2.3	8	0.8
Ba	1.6	6	0.6
Be	1.5	5	0.5
Ca 396.8	51.1	1000	100
Ca 317.9	51.4	1000	100
Cd	1.3	4	0.4
Co	2.3	8	0.8
Cr	1.8	6	0.6
Cu	2.7	10	1
Fe 259.9	42.5	200	20
Fe 271.4	55	200	20
K	126.0	1000	100
Mg 285.2	47.0	1000	100
Mg 279.0	54.8	1000	100
Mn	1.4	5	0.5
Mo	2.1	8	0.8
Na	589.0	1000	100
Ni	1.4	5	0.5
Pb	2.1	7	0.7
Se	1.9	7	0.7
Sb	3.7	14	1.4
Si	81.4	300	30
Sn	2.5	9	0.9
Sr	1.7	6.0	0.6
Ti	2.2	8	0.8
Tl	5.5	20	2
V	2.7	10	1
Zn	2.2	8	0.8

Notes:
1) The IDL results were obtained using the analysis of seven ICV/40 standards analyzed on separate days
2) The IDLs for all elements, except K and Si, were obtained by multiplying the standard deviation of the seven analysis by 3.14
3) The Reporting Limits were obtained by multiplying the IDLs by 3.6 (1.2x3) and rounding to 2 significant figures

EPA

STANDARD OPERATING PROCEDURE

PREPARATION OF AQUEOUS, TCLP EXTRACTS, SOIL/SEDIMENT/SLUDGE/SOLID, WASTE OIL/ORGANIC SOLVENTS, AND BIOLOGICAL TISSUE MATRICES BY BLOCK DIGESTION

Signature and Title

Prepared by:	Renee Lettieri, Chemist, OICS	Date
Peer Reviewed by:	Linda Boyer, Env. Protection Specialist, OICS	Date
QA Reviewed by:	Sumy P. Cherukara, Quality Assurance Officer	Date
Approved by:	John R. Bourbon, Chief, OICS	Date
Approved by:	Deborah A. Szaro, Chief, Laboratory Branch	Date

Annual Review

Reviewed by:	Signature	Date
Reviewed by:	Signature	Date

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2
DIVISION OF ENVIRONMENTAL SCIENCE & ASSESSMENT
LABORATORY BRANCH

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STANDARD OPERATING PROCEDURE

PREPARATION OF AQUEOUS, TCLP EXTRACTS, SOIL/SEDIMENT/SLUDGE, WASTE OIL/ORGANIC SOLVENTS, AND BIOLOGICAL TISSUE MATRICES BY BLOCK DIGESTION

1. Scope and Application

1.1 This method is used to digest by DigiBLOC, all environmental samples, with the exception of drinking water. These include aqueous, TCLP extracts, soil/sediment/sludge/solid, waste oil/organic solvent, and biological tissue. Samples are then analyzed using ICP-AES, SOP #C109 or ICP-MS, SOP # C-112.

1.2 This SOP is based on EPA Methods 200.2, Revision 8.8 and EPA Method 200.8, Revision 5.4.

2. Summary of Method

2.1 Aqueous or Aqueous TCLP: A suitable aliquot (usually 50 mL) of a well mixed, aqueous or homogeneous extract sample is accurately measured into a DigiTUBE and heated on the DigiBLOC at 85° C with HNO_3 and HCL until the volume is reduced to 20mL. A watch glass is then placed on the tube and the sample is gently refluxed for an additional 30 minutes. After cooling, the sample is brought up to a known volume, capped and mixed. If needed, the digestates may be filtered.

2.2 Soil/Sediment/Sludge/Solid: Samples may be dried for a minimum of 12 hours at 60°C, ground well and mixed thoroughly or the drying step may be eliminated by digesting the samples as they are received. A correction factor derived from a Percent Solids determination is applied to the final result for either method. An aliquot is accurately weighed into a DigiTUBE and digested with HNO_3 and HCL at 95° C for 30 minutes. After cooling, the sample is filtered and brought up to a known volume, capped and mixed.

2.3 For biological tissue digestion, the sample is accurately weighed into a DigiTUBE and digested with HNO_3 and 30% H_2O_2.

2.4 Samples are then analyzed using ICP-AES or ICP-MS. In all instances, great care must be exercised to avoid contamination.

3. Definitions

See SOP#G-15 for definitions.

4. Interferences

Samples must be well mixed and as homogenous as possible. Soil/Sediments/ Sludges/Solids must be reduced to as small a particle size as practicable.

5. Safety

5.1 The toxicity or carcinogenicity of each reagent used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure should be kept to an absolute minimum by following the appropriate standard safety procedures, e.g. wear proper protective equipment, gloves, lab coat, and working inside hoods whenever possible. Refer to Edison Facility Safety Manual Region II, Part 2 - Laboratory Safety for specific guidelines.

5.2 Safety guidelines for the DigiBLOC

5.2.1 The DigiBLOC must be grounded and have a clearance of 3 inches on all sides. It must be located in an operable fume hood if the DigiVAC is not available. Do not mount DigiBLOC on a surface of flammable material.

5.2.2 The DigiBLOC must be lifted only from the bottom, not by the top white trim. Acquire assistance to move the unit.

5.2.3 Use caution when working around the instrument during operation. The unit has exposed hot surfaces.

6. Apparatus and Materials

6.1 DigiBLOC Digestion System consisting of the Hot Block, with two 24 Position Racks with front and back airfoils,

6.2 DigiPROBE Sample Temperature Controller and probe.

6.3 DigiSET Sample Volume Controller and volume probe.

6.4 DigiVAC Exhaust System

6.5 50 mL DigiTUBEs, screw caps and disposable ribbed watch glasses.

6.6 Top loading balance capable of measuring 0.01 gram, disposable spatulas and small weighing dishes for soil/sediment/sludge/solid digestion.

6.7 Porcelain evaporating dishes (195mL), pestles and glass stirring rods for soil/sediment/sludge/solid digestion.

6.8 Two re-pipettes capable of dispensing 0.25-5.0mL.

6.9 Two automatic pipettes (1-250uL & 1-1000uL).

6.10 Whatman #41 filter paper - 125mm.

6.11 Disposable polypropylene funnels (65mm) and 100mL disposable beakers.

6.12 Filtration rack

7. Reagents and Solutions

All reagents must be of high purity and suitable for trace metal analysis.

7.1 Concentrated Nitric Acid ($HN0_3$)

7.2 Ultrex Concentrated Nitric Acid ($HN0_3$)

7.3 Concentrated Hydrochloric Acid (37%)

7.4 Hydrogen Peroxide, 30%

7.5 Reagent Grade Water

7.6 SPEX CertiPrep Custom Claritas Standard High Check containing 250ug/mL (250ppm) of each of the following: Ag, Al, As, B, Ba Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Se, Sb, Si, Sr, Ti, Tl, V, Zn, Sn or equivalent.

7.7 SPEX CertiPrep Custom Multi-element Standard ICV II containing 250mg/l (250 ppm) of each of the following: Al, Ca, Fe, Mg, K, Na, Si or equivalent.

7.8 Soil LCS - Environmental Resource Associates: Trace Metals in Soil or equivalent.

7.9 Biological Tissue LCS - DOLT-3 National Research Council, Canada, Tort-2 National Research Council, Canada, NIST 15666 - Oyster Tissue or other suitable material.

8. Sample Collection, Preservation, Storage and Holding Time

8.1 Aqueous: Samples may be collected in plastic or glass. Samples must be preserved to a pH<2 using $HN0_3$, may be stored at room temperature and should be digested and analyzed within 6 months of collection.

8.2 Soil/Sediment/Sludge/Solid: Samples may be collected in plastic or glass. Samples must be stored at 4° C and should be digested and analyzed within 6 months of collection unless stored at -20° C after air-drying.

8.3 Biological Tissue: Samples may be collected in plastic or glass containers and must be stored at -20°C.

8.4 Waste Oil/Organic Solvents: Samples do not require any preservaton and are stored at room temperature.

8.5 Drum sample usually have no temperature or holding time requirements.

9. Sample Preparation

9.1 Aqueous Sample Preparation

9.1.1 Verify that the pH of the sample is <2 using pH test paper. Record in the Metals Sample pH log book. If the pH is >2, add concentrated HNO_3 until the pH is <2, then wait at least 16 hours before rechecking the pH and proceeding with the sample prep.

9.1.2 Transfer 50mL (or other suitable aliquot) from a well mixed, acid preserved sample to a 50mL DigiTUBE. In addition, prepare a Prep Blank, two LCS's and 1 matrix spike for each project/matrix with at least one matrix spike per batch of 20 or fewer samples. Also prepare extra blank sample tubes that will hold the DigiPROBE and, if used, the DigiSET volume control probe. Refer to Section 14.1 of this SOP for QC procedure.

9.1.3 Add 0.5 mL concentrated nitric acid and 0.25mL of concentrated hydrochloric acid to each tube.

9.1.4 Insert the tubes into the DigiBLOC for solution evaporation at a pre-tuned temperature of 85 °C. If space permits, leave the outer rows empty. Position the extra blank samples under the exhaust hole of the DigiVAC. Carefully position the DigiPROBE in one tube and the DigiSET volume control set to 20mL in the other tube. If the DigiVAC is unavailable, carefully place the instrument in a hood and proceed. If the DigiSET is not used, monitor volume visually.

9.1.5 Close the DigiVAC lid and turn power on to the DigiVAC, DigiSET and DigiBLOC.

9.1.6 Reduce volume to approximately 20 mL by gently heating at 85°C then cap each tube with a disposable ribbed watch glass and reflux for 30 minutes.

9.1.7 Remove from DigiBLOC. Allow to cool. Filter, if necessary. (See Section 9.2.7) Dilute to 50 mL with Reagent Grade water, cap and mix well.

9.2 Soil/ Sediment/Sludge/Solid Preparation

9.2.1 Sample Drying

9.2.1.2 Pre-Drying Method

This method works best for samples that have a high water content. Evaporating dishes and pestles must be rinsed with 10% HNO_3.

Transfer the sample to a 195mL porcelain evaporating dish using a glass stirring rod or disposable spatula and dry at 60°C for a minimum of 12 hours. Cool, then grind with a pestle in the porcelain evaporating dish. Mix well, transfer to a plastic or glass container and store at 4°C until ready to digest.

These sediment samples require a % Solids determination. See the METALS % SOLIDS LOGBOOK for procedure. % Solids results are reported under SOLA in LIMS. This does not preclude an analysis request for % Solids.

9.2.1.2 "As Received" Method

This method works best for samples that have a low water content. Samples are digested as received. A % Solids determination is performed using the procedure described in the METALS % SOLIDS LOGBOOK. % Solids results are reported under SOLA in LIMS. This does not preclude an analysis request

for % Solids.

9.2.2 Weigh 0.5g or other suitable aliquot of well mixed sample into a 50 mL DigiTUBE. Use approximately 5mL of Reagent Grade water to rinse down the sides of the DigiTUBE. In addition, prepare a Prep Blank, two LCS's, 1 matrix spike for each project/matrix with at least one matrix spike per batch of 20 or fewer samples and an extra sample that will hold the DigiPROBE. Refer to Section 14.2 for QC prep.

9.2.3 Under a fume hood, add 5 mL Reagent Grade water, 1.0mL conc. HNO_3 and 1.0mL of conc. HCL to the tubes. Keep samples under the hood until any reaction subsides.

9.2.4 Insert the tubes into the DigiBLOC for digestion at a pre-tuned temperature of 95°C. If space permits, leave the outer rows empty. In the extra sample tube, using a disposable watch glass with a hole, carefully position the DigiPROBE. This digestion may also be carried out using the DigiVAC.

9.2.5 Place a disposable watch glass on each tube and turn on the power to the DigiBLOC. If being used, close the DigiVAC lid and turn the power on to the DigiVAC

9.2.6 Heat samples at 95° C for 30 minutes. The DigiBLOC takes about 30 minutes to heat up to temperature.

9.2.7 Filtration is required for soil/ sediment/sludge/solid samples. Label a duplicate set of DigiTUBEs. Rinse Whatman #41 filter paper in disposable funnels with approximately 10mL Reagent Grade water. Place rinsed funnels into duplicate DigiTUBEs and transfer corresponding sample. Rinse original tube several times with Reagent Grade water. Dilute to 50mL with Reagent Grade water, cap and mix well.

9.3 Biological Tissue Digestion

9.3.1 Homogenize the samples. Store samples in the freezer if digestion is delayed, then defrost prior to preparation for digestion. All determinations, including the LCS and matrix spike must be done in triplicate. Refer to Section 14.3 of this SOP for QC prep.

9.3.2 Weigh 2.0 g finely ground and well mixed sample or 1.0 g LCS (Dolt-3, Tort-2 or NIST 15666 Oyster Tissue) into a 50 mL DigiBLOC tube. Record actual weights

in Prep Book. Be careful not to let tissue stick to sides of tube - aim for the bottom of tube. Prepare three tubes for the Prep Blanks and weigh an additional tissue sample for the DigiPROBE.

9.3.3 Add 5 mL concentrated Ultrex HNO_3 and swirl to mix. Heat gently in the DigiBLOC (tuned to 95° C) with continued swirling. If samples begin to foam, remove from heat until foam subsides. Continue to heat/cool and swirl until samples no longer foam, then digest at 95° C until sample appears clear. A 2 g sample should be clear after about 15 minutes of digestion.

9.3.4 Foaming is a more serious problem with the LCS. Dolt –3 will foam copiously when warmed with HNO_3. Extreme care is needed in swirling and gently heating until the LCS/HNO_3 mixture appears clear. Then allow to digest at 95°C in the DigiBLOC for an additional 15 minutes.

9.4.5 After digestion with HNO_3 is completed, add 0.5 mL 30% H_2O_2 in 0.1 mL portions to each of the tubes, swirling and heating with each addition until any effervescence subsides. It then should be safe to add 0.5 mL portions of the H_2O_2, heating in between additions until the samples become totally clear. After samples are totally clear, add 1 mL additional H_2O_2, cover the tubes with a plastic watch glass and digest for 30 minutes more. Remove from the DigiBLOC, cool and dilute to 20 mL with Reagent Grade water. Cap securely and mix well.

10. Instrument Operating Conditions

10.1 DigiBLOC set-up

10.1.1 Power ON - Power switch.

10.1.2 Check Temperature Set-Point by pressing the star button (*). Temperature should be set at 85° C for Aqueous and TCLP extracts, 95° C for soil/sediment/sludge/solid, waste oil/organic solvent and biological tissue. If the temperature must be changed or the DigiPROBE is either connected or disconnected, the instrument must be tuned.

10.1.2.1 Set temperature by pressing and holding the star button (*) while simultaneously pressing the ▲ (arrow up) or the ▼ (arrow down) button to obtain the desired temperature.

10.1.2.2 Tune DigiBLOC as follows:

– Set desired temperature.

– Hold the ▲(arrow up) and ▼(arrow down) keys simultaneously for ≈ 3 seconds to enter program mode. The display will show *tunE.*

–While holding the star button(*), hit the ▲(arrow up) to reach *AESP (the E is actually an upside down F)* and then release the star button (*).

– Press and hold buttons simultaneously for 3 seconds until the temperature appears. The system will flash between *tunE, AESP* and the current temperature.

–When tuning is complete, the system will automatically turn *tunE* off and display the current temperature only.

10.2 DigiBLOC Shut-down

10.2.1 Power OFF - DigiBLOC and DigiVAC if used

10.2.2 Rinse DigiPROBE with Reagent Grade water and place in a clean empty tube.

11. Sample Analysis

Actual sample analysis is carried out using methods SOP #C-109 Trace Metals in Aqueous, Soil/Sediment/Sludge/Solid,Waste Oil, Organic Solvent, Biological Tissue- ICP-AES or SOP #C-112 Trace Elements in Aqueous, Soil/Sediment/Sludge/Solid, Waste Oil, Organic Solvent and Biological Tissue by ICP-MS.

12. Data Analysis and Calculations

Calculations are not done as part of this method. All weights and dilutions are recorded in the Metals Sample Prep Log Book

13. Method Performance

Method performance is evaluated as part of methods SOP #C-109 Trace Metals in Aqueous, Soil/Sediment/Sludge/Solid, Waste Oil,Organic Solvent, Tissue - ICP-AES or SOP #C-112 Trace Elements in Aqueous, Soil/Sediment/Sludge/Solid, Waste Oil, Organic Solvent and Biological Tissue by ICP-MS.

14. Quality Control

14.1 Aqueous Quality Control

14.1.1 One Prep Blank (PB) should be prepared for every batch of 20 or fewer samples. The PB is prepared by transferring 50mL of Reagent Grade water into a 50mL DigiTUBE and adding 0.5mL HNO_3 and 0.25mL HCl.

14.1.2 Two LCS's (Laboratory Control Samples) are prepared for every batch of 20 or fewer samples. These LCS's are made by pipetting 20uL of (CAL I) SPEX CertiPrep Custom Claritas Standard (250PPM) and 400uL of SPEX CertiPrep Custom Multi-element Standard ICV II (250PPM) into 50mL DigiTUBEs containing 50 mL Reagent Grade water, 0.5mL of concentrated HNO_3 and 0.25mL concentrated HCl.

14.1.3 One Matrix Spike (MS) is prepared for each matrix per project with at least one MS per batch of 20 or fewer samples. The MS is prepared by adding 20uL of (CAL I) SPEX CertiPrep Custom Claritas Standard (250PPM) and 400uL of SPEX CERTIPREP Custom Multi-element Standard ICV II (250PPM) to a DigiTUBE containing 50 mL of a duplicate environmental sample, 0.5mL of concentrated HNO_3 and 0.25mL concentrated HCl.

14.2 Sediment Quality Control

14.2.1 One Prep Blank should be prepared for every batch of 20 or fewer samples. The PB is prepared by transferring 5mL of Reagent Grade water into a 50mL DigiTUBE and adding 1.0mL HNO_3 and 1.0mL HCl.

14.2.2 Two LCS's are prepared for every batch of 20 or fewer samples. These LCS's are made by weighing 0.5g of ERA's Trace Metals in Soil into a 50mL DigiTUBEs and adding 5mL of Reagent Grade water to wash down the sides of the tube, 1.0mL HNO_3 and 1.0mL HCl.

14.2.3 One Matrix Spike is prepared for each matrix per project with at least one MS per batch of 20 or fewer samples. The MS is prepared by adding 20uL of (CAL I) SPEX CertiPrep Custom Claritas Standard (250PPM) and 400uL of SPEX CERTIPREP Custom Multi-element Standard ICV II (250PPM) to a 50mL DigiTUBE containing 0.5g of a duplicate environmental sample, 5mL of Reagent Grade water, 1.0mL HNO_3 and 1.0mL HCl.

14.3 Biological Tissue Quality Control

14.3.1 Three Prep Blanks are prepared for every batch of 20 or fewer samples. The PB is prepared by transferring 5mL of conc. HNO_3 and 5 mL 30% H_2O_2 into a 50mL DigiTUBE and digesting at 95°C for about 45 minutes, then diluting to 20mL with Reagent Grade water.

14.3.2 The LCS is prepared in triplicate for every batch of 20 or fewer samples. DOLT-3 is presently being used for the LCS, but Tort-2 , NIST 15666 Oyster Tissue or other suitable material are also acceptable. Digest as directed in 7.4.

14.3.3 The Matrix Spike (MS) is prepared in triplicate for each matrix per project for each batch of 20 or fewer samples. The MS is prepared by adding 20uL of (CAL I) SPEX CertiPrep Custom Claritas Standard (250PPM) and 400uL of SPEX CertiPrep Custom Multi-element Standard ICV II (250PPM) to a DigiTUBE containing 2.0g of a duplicate biological tissue sample and digesting as directed in 7.4.

15. Reporting and Validation

Copies of all Log Book entries (pH, Sample Preparation, Percent Solids) are included in the final data packages.

16. Pollution Prevention

16.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the USEPA recommends recycling as the next best option.

16.2 The quantity of chemicals purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

16.3 For information about pollution prevention that may be applicable to laboratories, consult *"Less is Better: Laboratory Chemical Management for Waste Reduction"*, available from the American Chemical Society's Department of Government

Regulations and Science Policy, 115 16th Street N.W., Washington D.C 20036, (202)872-4477.

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18. References

1. EPA Method 200.2, Revision 2.8.
2. SW846 3010A
3. Operation Manual for DigiBLOC 3000 Digestion System
4. DigiVAC Operation Manual

EA Engineering, Science, and Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152
TEL: (410) 771-4950

LETTER OF TRANSMITTAL

TO: **Ron Naman**

U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, NY 10007-1866
212-637-4375

DATE: 16 December 2010	JOB NO 62305.01
ATTENTION: **Ron Naman**	
RE: **Final Report –** Vineland Chemical Superfund Site: Phase V Sediment Sampling, Vineland, New Jersey	

WE ARE SENDING YOU:		X	Attached				Under separate cover via _____ the following items:		
	Shop drawings		Prints		Plans		Samples		Specifications
	Copy of letter		Change order			X	Other: Final Report		

COPIES	DATE	NO.	DESCRIPTION
2	December 2010	1	*Final Report - Vineland Chemical Superfund Site: Phase V Sediment Sampling, Vineland, New Jersey*

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SIGNED: Peggy Derrick

Peggy Derrick
Project Manager

If enclosures are not as noted, kindly notify us at once.